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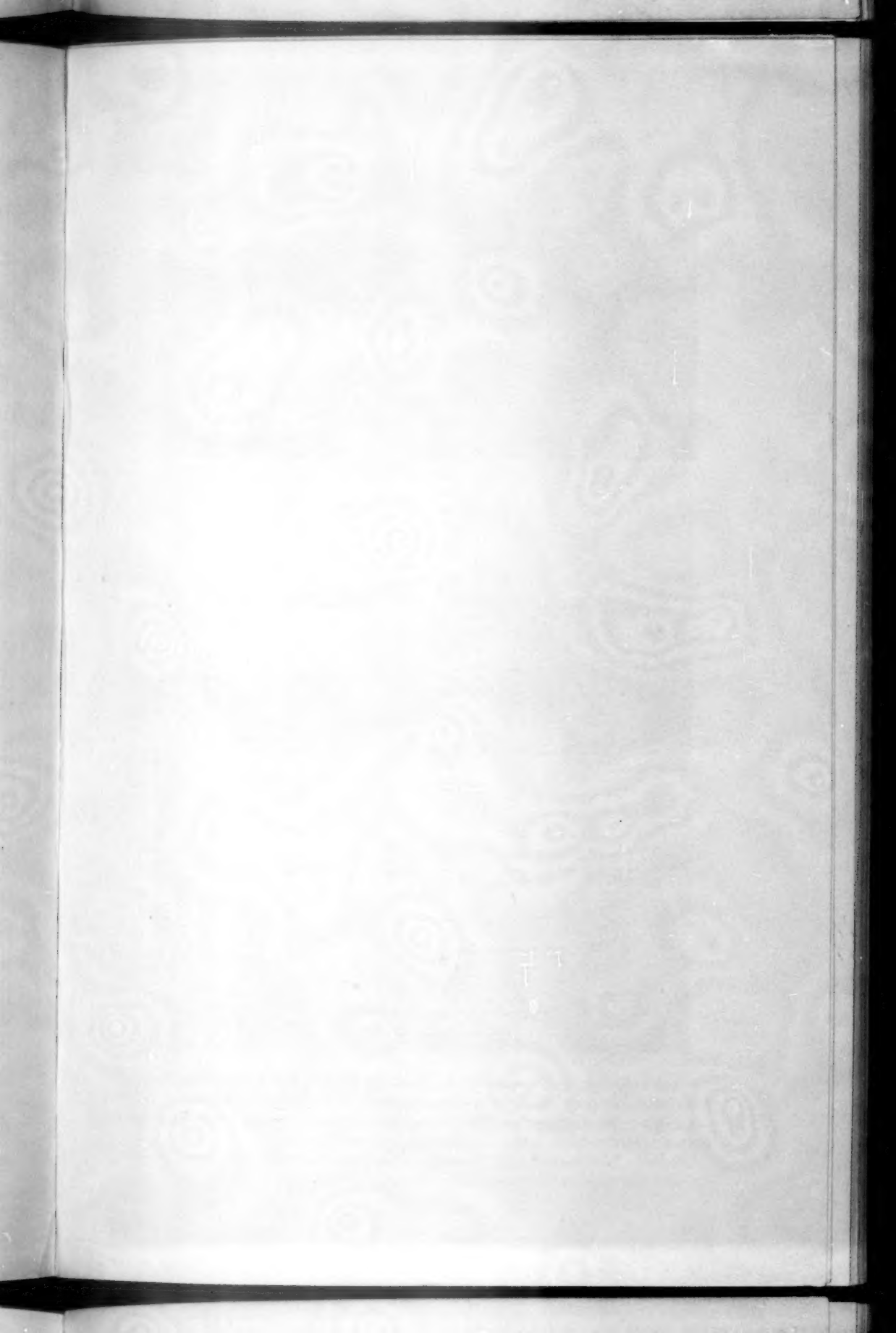
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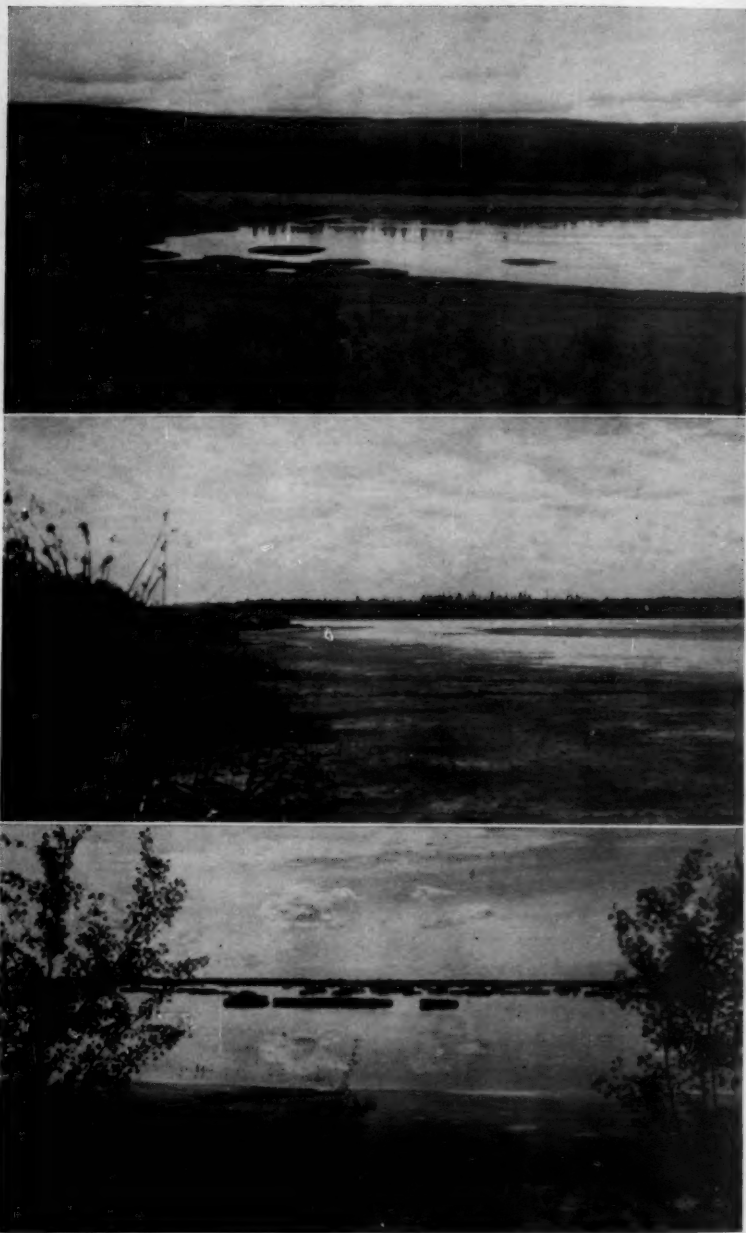
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(Top) LOOKING SOUTH ACROSS EASTERN EXTREMITY OF KEEPING LAKE, 2.5 MILES EAST OF ALBERTA-BRITISH COLUMBIA BOUNDARY. JULY 10, 1944.

(Middle) BULRUSHES AND SEDGES ON EAST SHORE OF FLOOD LAKE, LOOKING SOUTH. WATER-LEVEL GREATLY REDUCED. AUGUST 13, 1944.

(Bottom) MAGLIORE LAKE, LOOKING WEST FROM EAST SHORE. NOTABLE FOR ITS ISOLATED STANDS OF BULRUSHES. AUGUST 14, 1944.

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BIRDS OBSERVED IN THE GRANDE PRAIRIE— PEACE RIVER REGION OF NORTHWESTERN ALBERTA, CANADA

BY J. DEWEY SOPER

INTRODUCTION

IN 1944, I was assigned, as a part of investigations of natural resources under the North Pacific Planning Project, to study the distribution and abundance of birds and mammals in that portion of west-central Alberta extending from Athabaska west to the boundary between Alberta and British Columbia.

By far the most of the observations were carried out in that part of the province west of Lesser Slave Lake. That area, as a whole, is generally referred to as the Grande Prairie-Peace River Region. Considerable work was also conducted in the territory from the town of Athabaska westward to and along Lesser Slave Lake. All principal, ornithological data obtained in the whole region brought under observation are presented in the following annotated list. The width of this territory from Athabaska to the eastern border of British Columbia is approximately 270 miles; the maximum north-south depth, westward from High Prairie, is about 130 miles.

Owing to their greater economic importance, waterfowl were accorded special attention, though the general ornithological survey embraced all species of birds within the region. Specialization in wildfowl determined the choice of working localities throughout the summer, camps being invariably established on the shores of lakes. An exception to this was a side trip in late July to the Rocky Mountains south of Beaverlodge; species observed exclusively in the cordillera, proper, are not included in the present paper. During the season, detailed studies of wildfowl were made at 32 lakes. A lengthy departmental report deals with each of these individually. In the

present instance, only a brief summary of status, ratios of abundance, and distribution can be given, together with some information on reproduction.

Previous to the present investigations, very little was known about the birds of the Albertan region under consideration. We had practically no information on the smaller birds in most of the area and only scattered, miscellaneous data in regard to the larger ones. The widespread, waterfowl survey in the summer of 1944 was the first of its kind ever undertaken in this part of the province. Most of the lakes had never been visited by any naturalist.

Of particular interest in this connection is the work done by Cowan (1939) in the Peace River Block of British Columbia; this area of prairie-parklands flanks the Grande Prairie-Peace River territory of Alberta and possesses comparable ecological conditions, with an essentially similar fauna. Also related are papers by Soper (1942) and Rand (1944) for tracts of near by country. For comparative reference in relation to the regional avifauna, as a whole, these publications have a special interest and value.

Investigations under the North Pacific Project commenced in the country between Clyde and Athabaska on May 23, 1944. A day was devoted to bird observations along Athabaska River, followed by several days at Baptiste Lake. Before the end of the month, preliminary waterfowl and other inquiries were carried out at Island, Long and Lawrence lakes and Lesser Slave River. Further attention was given to these water areas later in the season on the return from Peace River.

The early part of June was spent at Lesser Slave and Sturgeon lakes. Operations were then transferred to the Grande Prairie district where, up to the end of the month, investigations were carried out chiefly at Clairmont, Ferguson, Bear, Hermit, Hughes and Saskatoon lakes and adjacent areas. During the early half of July much of the northern portion of the Grande Prairie district received attention, as well as the territory between Saskatoon Lake and the British Columbia border. Among the areas studied on this occasion were Buffalo, Valhalla, La Glace, Updike, Brainard, Sinclair and Ray lakes. Some field work was then conducted south of Wapiti River and in the Spirit River district.

Most of the early half of August was devoted to the country north of Peace River. Though a general wildlife reconnaissance was carried out over a relatively wide tract of country, most of the observations were made in the district north of Fairview to Eureka River and Clear Hills, and at Cardinal and Flood lakes. Some ornithological data

were also secured in the Peace River Valley between the town of Peace River and the mouth of Smoky River. The remainder of August was fully occupied with work at Magliore, Kimawan and Winagami lakes, with a brief coverage of the parklands country from McLennan to Watino, in the valley of Smoky River. The return journey was now commenced. Further observations were conducted en route at Lesser Slave and Mitsue lakes and the several small bodies of water which lie along the main road from Lesser Slave Lake to Athabaska. Early in September these inquiries came to a close, and Winnipeg headquarters was reached again on September 11, after an absence of four months.

TOPOGRAPHY AND VEGETATION

For the most part the region consists of a vast, rolling plain with an average elevation of about 2,000 feet above sea level. By far the greater part of it is still in a primitive condition, widely crowned by a boreal forest of varying density and quality. This wilderness sweeps almost unbrokenly northward from the vicinity of Edmonton to the Arctic Ocean and west to the Rocky Mountains. The mean slope of the terrain is a gradual one from the south and west to the lower lands of the Mackenzie River Basin. It lies wholly upon the Arctic watershed, with the principal drainage by way of Athabaska, Peace and Slave rivers, whose combined waters, forming Mackenzie River, flow to Beaufort Sea.

From point to point, difference in elevation is considerable. Thus, in the eastern section on the lower Peace-Athabaska drainage, the land descends to an altitude of about 700 feet and rises in some western localities to over 3,000 feet, exclusive of Rocky Mountain districts.

Within the territory covered in 1944, the largest of these eminences is a long, bold ridge known as the Swan Hills. It lies immediately south of Lesser Slave Lake, rises in places to 4,000 feet above sea level and thus towers above the waters of the lake to a height of about 2,000 feet. An almost equally conspicuous landmark is the Beaver Hills to the north of this lake. Scattered hills and ridges of lesser prominence occur in the Grande Prairie-Peace River territory. Among the larger of these, south of Peace River, may be mentioned Saskatoon, Blueberry and Saddle hills and immediately north of that stream, Clear and Whitemud hills. Many of these major ridges rise from 500 or 600 to over 1,000 feet above the surrounding terrain. A well-developed drainage system is effected by numerous streams, many of which are large and played an important part in the early fur trade and

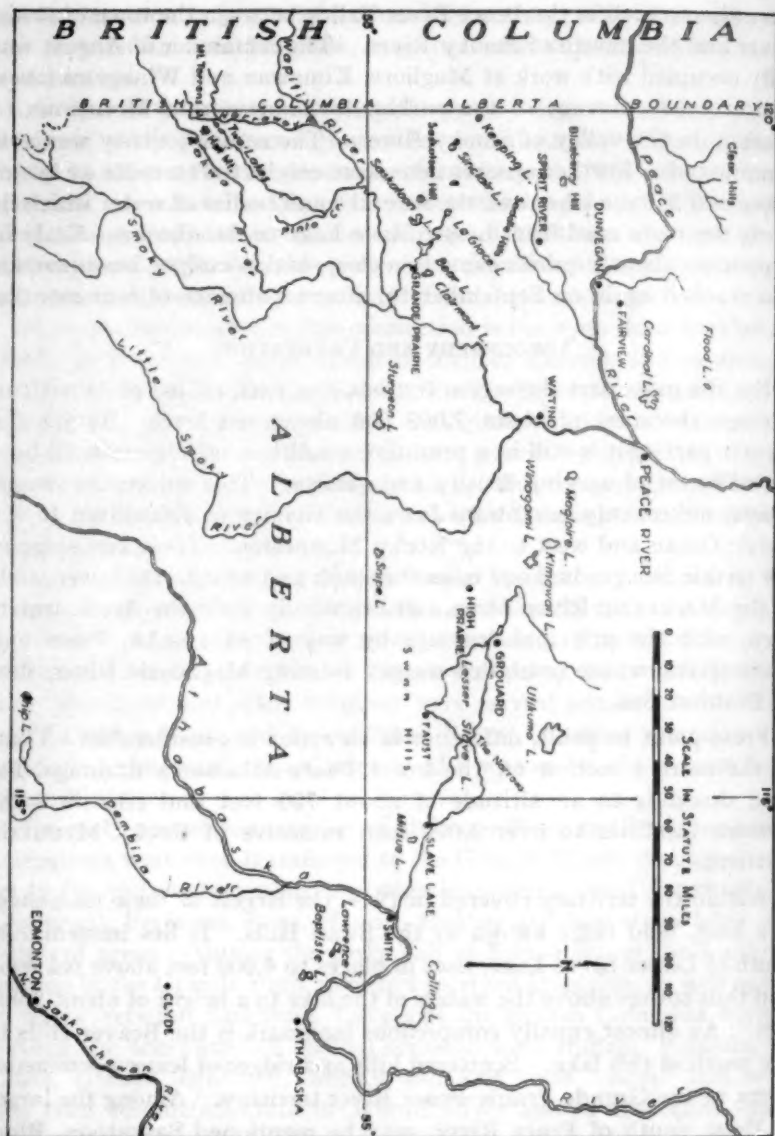


FIGURE 1.—Sketch map of west-central Alberta from Edmonton to Grande Prairie and Peace River.

settlement of the region. Lakes are numerous in some areas, Lesser Slave being the largest in the precise territory being surveyed.

Characteristic of this region are scattered areas of prairie-parklands which, in primitive times, were overrun by large herds of elk and bison. Today, they have been almost wholly brought under cultivation. They are far from being even nearly continuous and are broken up into isolated tracts with broad belts of boreal forest intervening. Chief of these open, agricultural lands are the areas which may be referred to as the High Prairie, Grande Prairie, Spirit River, Peace River and Smoky River blocks, respectively. All are separated from the nearest, extensive farming lands of central Alberta by an unbroken expanse of mixed-wood forest over 200 miles in width.

In the Dominion classification of the plant cover, the present territory comes totally within the Boreal Forest Region. Coniferous tree growth is predominant. The characteristic association is a mixture, in varying proportions, of: white spruce, *Picea canadensis*; balsam fir, *Abies balsamea*; aspen and balsam poplar, *Populus tremuloides* and *P. balsamifera*; and white birch, *Betula alba*. Superior development of white spruce is often pronounced along streams and the shores of lakes. On the heavier-textured soils are extensive, highly-developed stands of aspen and balsam poplar, usually mixed with conifers. Jack pine, *Pinus Banksiana*, associations tend to predominate on sandy soils. A mixture of this species and black spruce, *Picea mariana*, are often characteristic of the rolling tops of ridges and plateaus, but the latter is also a dominant in the numerous tracts of muskeg at all elevations. In more western areas the jack pine is replaced by the lodgepole pine, *Pinus murrayana*.

Also typical of the regional flora is a rich growth of shrubbery, of which many species and varieties of willow, *Salix*, and alder, *Alnus*, are the most prominent. They often form almost impenetrable thickets. Among the characteristic species are: serviceberry, *Amelanchier florida*; silverberry, *Elaeagnus argentea*; red-osier dogwood, *Cornus stolonifera*; chokecherry and pincherry, *Prunus virginiana* and *P. pennsylvanica*; buffaloberry, *Shepherdia canadensis*; snowberry, *Symphoricarpos pauciflorus*; and wolfberry, *S. occidentalis*.

Characteristic bog and muskeg cover includes: Labrador tea, *Ledum groenlandicum*; dwarf birch, *Betula glandulosa*; cloudberry, *Rubus chamaemorus*; bog cranberry, *Vaccinium Oxycoccus*; and sphagnum moss, *Sphagnum capillaceum*. In some areas, particularly on the scattered prairies, flowering vascular plants occur seasonally in prolific and showy abundance.

FAUNAL ZONES

All of the territory under discussion lies in the Coniferous Forest Biome, or the Canadian Life Zone, as more familiarly known under the Merriam system of classification. It is also comparable to the nearly continent-wide, mid-section of the Boreal Forest Region, as the northern wooded territory east of the Rockies is classified by the Dominion Forest Service (Halliday, 1937).

Any observer will note that many species are notoriously local in their occurrence, though they may be distributed in a spotty fashion over large geographical range. This holds true for many birds that are typical summer, or permanent, residents within the Canadian Life Zone. This is ordinarily the case even in territory which is broadly homogeneous throughout, but where some of the species concerned are restricted to a narrow choice of selected habitats of very local and specialized character. Occasionally, as in the open parklands areas of the Grande Prairie-Peace River region, occurrence and differentiation of the population complex exist on a wider basis.

I wish particularly to draw attention to the more or less peculiar faunal characteristics of the latter territory. As previously mentioned, large tracts are of an insular character arising from the presence of a prairie-parklands type of environment. The predominant vegetation is composed of various grasses, vascular plants, shrubs and aspen-poplar. The majority of the numerous lakes are comparatively shallow and usually support a wealth of emergent and subaquatic vegetation. While many avian species inhabiting these prairies and their lakes are normally to be regarded as typical, or more characteristic of, the Transition Life Zone, the majority are unquestionably those of the Canadian Zone. This circumstance does not exist among the mammals, as the nearest approach to campestrian species is 200 miles, or more, to the southeast.

Despite this broad "barrier" of intervening coniferous-deciduous forest, many members of the regional avifauna that are characteristically, though not, of course, exclusively of Transition Zone complexion, attain and breed in the prairie-parklands of northwestern Alberta. The same is true of adjacent parts of British Columbia (Cowan, 1939). Some of these which may be mentioned are: ring-necked pheasant (introduced), sharp-tailed grouse, upland plover, Wilson's phalarope, Franklin's gull, eastern phoebe, purple martin, blue jay, long-billed marsh wren, western meadowlark, Brewer's blackbird, Nevada cowbird, and Leconte's, vesper and clay-colored sparrows. Many other species, with which one may have first become

familiar in a Transition or Upper Austral Zone setting, also range deeply within the Canadian Zone. Aside from these isolated, north-western prairies of superficial transitional zone aspect, the whole of the region is of unmodified Canadian Zone character.

ACKNOWLEDGEMENTS

I wish to express my indebtedness to the many kindly people of the northwestern region who assisted me in many ways during the 1944 expedition. My thanks are also tendered to Dr. A. L. Rand, at that time in the National Museum of Canada, Ottawa, who read the manuscript of this paper and offered valuable suggestions.

ANNOTATED LIST OF BIRDS

Gavia immer (Brunnich). Common Loon.—Comparatively rare, particularly in the western portion. Pairs were recorded at Baptiste, Lawrence, Lesser Slave and Sturgeon lakes from late May to mid-June, 1944. Not again observed until the latter part of July when a pair, with two immatures, was found inhabiting a small lake south of Wapiti River, north of Nose Mountain, Canadian Rockies. The species was nowhere encountered on the lakes of the Grande Prairie-Peace River Region.

Colymbus grisegena Boddaert. Red-necked Grebe.—Of fairly common occurrence, in a few places abundant. Noted in nearly all areas from Baptiste Lake to Sturgeon Lake; at the latter point during the second week of June, nests were found with practically fresh eggs. To the westward it was recorded at Saskatoon, Cutbank, Sinclair, Ray, Updike, Keeping and La Glace lakes. The birds were particularly common at Ray Lake, where from July 3 to 5, numerous nests were found with clutches of eggs numbering from two to four; many young were hatching at this time. Similar conditions existed at Sinclair Lake, July 6 to 8. The species was fairly common at Winagami Lake, with well-developed young, during the third week of August.

Colymbus auritus Linnaeus. Horned Grebe.—A rare inhabitant of the region. Observed only at Saskatoon and Cutbank lakes where it was represented by only a few pairs. Undoubtedly breeds, but neither nests nor young were noted.

Colymbus nigricollis (Brehm). Eared Grebe.—Common and widely distributed. In some lakes of the Grande Prairie district this bird is much more abundant than any species of duck. It was observed at all but a few of the 32 lakes examined during the season. By a wide margin this is the most abundant diver in the region. The greatest colony was observed at Clairmont Lake, June 18 and 19, where there were an estimated 3,000 individuals; about 1,200 nests were located amid pondweeds in the open lake. The species was also notably abundant at Hermit Lake on June 22; there were an estimated 700 individuals, with at least 300 nests built in the fringe of bulrushes on the east side of the lake; all contained from one to four eggs. The birds were also common at Saskatoon, Cutbank, Sinclair, Updike, La Glace, Buffalo, Cardinal, Magliore and Winagami lakes. First newly hatched young were seen at Sinclair Lake on July 7. Lesser numbers were observed in several lakes to the southeast as far as Baptiste Lake.

Aechmophorus occidentalis (Lawrence). Western Grebe.—Sparingly distributed in Baptiste and some other lakes in the Smith district and at Lesser Slave Lake. In the Grande Prairie area it was only once detected; this was a solitary individual at Bear Lake, on June 20. On the other hand, the species is a common breeder north

of Peace River, where adults and immatures were seen in considerable numbers at Cardinal Lake (August 4 to 8), and it is said to be numerous at St. Germain Lakes. The birds were fairly common at Magliore Lake and of sparing occurrence at Winagami Lake, August 14 to 21, where they were accompanied by well-grown immatures.

Podilymbus podiceps (Linnaeus). Pied-billed Grebe.—One noted at Baptiste Lake on May 27. Not observed throughout the summer at any other body of water west to the boundary between Alberta and British Columbia.

Pelecanus erythrorhynchos Gmelin. White Pelican.—Rarely observed. Seventy-four were seen at Faust, Lesser Slave Lake, on June 5 and 6. A solitary example was noted, on June 20, at the south end of Bear Lake. It was next recorded on August 23, when six were frequenting "The Narrows" of Lesser Slave Lake north of Kinuso.

Ardea herodias Linnaeus. Great Blue Heron.—Not personally observed. I was informed on apparently good authority that a few years ago a small colony of these herons nested on Dog Island near the eastern end of Lesser Slave Lake. The description of these birds and the character of their bulky nests in the trees leave no doubt as to their former occurrence at this point.

Botaurus lentiginosus (Montagu). American Bittern.—Reported as occurring at Baptiste Lake; along Lesser Slave River; and at the small, marshy lakes immediately east of Lesser Slave Lake. On June 19 one was flushed from the fringe of bulrushes at Ferguson Lake, Grande Prairie. No other individual was recorded in the region.

Cygnus columbianus (Ord). Whistling Swan.—My entry into northwestern Alberta in late May, and departure in late August, was too late and too early, respectively, to witness the migrants of this species. However, it was reported as occurring, during spring and fall, at many lakes in the region, west to Grande Prairie, at Winagami, Kimawan and Magliore lakes, in the McLennan district, and at Cardinal, Flood and Pluvius lakes, north of Peace River. It was said at some of these places that many hundreds of the birds put in an appearance to rest and feed on the lakes.

Cygnus buccinator Richardson. Trumpeter Swan.—Broadly speaking, the trumpeter swan is now sparingly distributed in the region from the east end of Lesser Slave Lake westward to lakes immediately west of Hythe, Alberta. This distribution, though spotty, is, therefore, seen to have a breadth of about 200 miles. The species was not detected at any lakes between Athabaska and Lesser Slave Lake, nor did any data secured from residents indicate its present occurrence in that district.

During the course of the expedition, the species was personally seen, or reported as occurring recently, at 13 lakes in the area indicated. In all, 64 adults and 14 cygnets were observed during the season, together with a nest containing six eggs. The majority of the adults and all the young encountered were noted in the Grande Prairie district. The birds were apparently absent from all small lakes of the heavily forested territory between Sinclair Lake and the British Columbia boundary. Since Cowan (1939) does not mention this species, it evidently does not occur in the adjacent British Columbia territory. Nothing was seen or heard of these birds south of Wapiti River or north of Peace River. In fact, I gained no evidence of their presence north of Saddle Hills. Consequently, it would appear that in this immediate territory the trumpeter swan is confined to the lakes of the Grande Prairie country.

Branta canadensis (Linnaeus). Canada Goose.—Considering the type and breadth of territory traversed, it is surprising that these geese were rather seldom observed. On May 29, a flock of 102 individuals was seen a few miles south of Smith flying to the northeast. A group of 10 birds was noted along the northeast shore of Lesser Slave Lake a few days later. During June, pairs were recorded at Faust; Sturgeon Lake; Hughes Lake (six immatures); and Saskatoon Lake. Only one pair was ob-

served during July; this was at Sinclair Lake. At Cardinal Lake (August 4 to 8) numbers were noted daily; the largest group was composed of 17 members (adults and immatures). A flock of 40 individuals was observed at Kimawan Lake on August 19. According to local reports, the birds are common during the spring and fall migrations at many lakes both north and south of Peace River.

Chen hyperborea (Pallas). Snow Goose.—Not personally observed. At many points I obtained information on the occurrence of these birds, during migration, at various lakes of the Grande Prairie-Peace River Region. It is only assumed that the species is the lesser snow goose.

Anas platyrhynchos Linnaeus. Mallard.—This is the predominant duck of the region, but it has only slight numerical superiority over the lesser scaup. Mallards were omnipresent in the waters of the entire territory, often varying only slightly in relative abundance from one lake to another. In only a few lakes were its numbers surpassed by any other species of ducks. In relation to all other ducks, its ratio varied from as low as 11 per cent to as high as 42, the average for 32 lakes being 26.3 per cent. Many hundreds of juveniles were observed. The first downy young were seen at Sturgeon Lake early in June.

Anas strepera Linnaeus. Gadwall.—Of sparing and irregular distribution. Of 32 lakes examined, it was recorded at only 15, all in the Grande Prairie district, with the single exception of one noted at Sinclair Lake, a few miles northwest of Hythe. Cowan (1939) does not record it for the adjoining Peace River Block of British Columbia. In relative abundance, the gadwall takes 13th place among the recorded ducks. From lake to lake it varied from approximately 1.1 to 5.0 per cent of the entire duck population; its average was 2.4 per cent. It doubtless breeds at all of the lakes in which it was observed during the height of the season. Juveniles were recorded positively only at Saskatoon Lake.

Anas acuta Linnaeus. American Pintail.—One of the scarcer ducks. While it was recorded in exactly half of the lakes investigated, as a rule very few birds were present. Specific ratios were: minimum, 0.2 per cent; maximum, 11.5; average, 2.5. The pintail ranks 12th in relative abundance among all ducks. It was decidedly more numerous at Magliore, Kimawan and Winagami lakes than elsewhere in the territory to the west and northwest.

Anas carolinensis Gmelin. Green-winged Teal.—In May, June and July, observed only at wide intervals and in very small numbers from Lesser Slave Lake west to the lakes of Grande Prairie. During August, adults with immatures were found more numerous in lakes north of Peace River and at Kimawan and Winagami lakes near McLennan. Of 32 lakes examined the species was recorded at 14. Specific ratios varied in different lakes from 0.3 to 7.7 per cent; average, 2.3. In scale of abundance, this teal takes 14th place among the ducks. The first newly hatched young were noted at La Glace Lake on July 11, but it is highly probable that some broods appeared about two weeks earlier. Several broods of well-developed immatures were observed at Cardinal Lake on August 7 and 8.

Anas discors Linnaeus. Blue-winged Teal.—This teal had a much more uniform distribution than the preceding species and was about twice as numerous. It was recorded at 25 lakes. Numerical ratios exhibited local variation from 0.3 to 15.3 per cent, the average being 4.5. In relative abundance, its place was 8th among the ducks. The species was found in nearly all the lakes: from Baptiste west to British Columbia; north of Peace River; and between Peace River and Winagami Lake. The earliest, downy juveniles were recorded at Sinclair Lake on July 6; thereafter, young were seen regularly and in some numbers at most of the lakes.

Mareca americana (Gmelin). Baldpate.—Widely distributed and an abundant breeding species throughout the territory. Recorded at 30 of 32 lakes. It ranks as the third most numerous duck of the region; its specific ratio varied from 2.2 to 45.8, the average being 12.7 per cent. It was most plentiful at Ferguson Lake. Large numbers of young were encountered in practically all lakes of the region visited after the third week of June.

Spatula clypeata (Linnaeus). Shoveller.—The sixth most abundant duck of the region. Variation in specific ratio ranged locally from 1.1 to 37.3 per cent; average 7.2. Recorded in 26 lakes, but in most localities the species was relatively, or actually scarce. It was found most abundant at the west end of Lesser Slave and at Winagami and South Buffalo lakes. Recently hatched, downy juveniles were first noted at La Glace Lake on July 11. After that date immatures were more or less regularly and frequently observed at other lakes.

Aythya americana (Eyton). Redhead.—Recorded only at Lesser Slave, Sturgeon, Clairmont, Ferguson, Bear, Hermit, Saskatoon, Cardinal and Winagami lakes. As a rule, only a few pairs were seen in any one lake, and sometimes only a single individual or a pair. The largest numbers were recorded at Buffalo Bay, Lesser Slave Lake, on June 8. In relative abundance the species assumes 11th place among the ducks; local ratios varied from 0.2 to 7.3 per cent; average 3.8. While it would appear almost certain that redheads breed in favorable habitats throughout this region, not a single immature bird was recorded.

Aythya collaris (Donovan). Ring-necked Duck.—On the whole, these ducks were scarce, as they were sparingly represented in only 10 lakes. The species ranks 15th in relative abundance among the ducks. Local ratios ranged from 0.4 to 4.0 per cent, with an average of 1.8. More were observed at Saskatoon and La Glace lakes than elsewhere. In the latter area, July 10 to 12, many broods of young were encountered, some of which were very small and obviously only a few days old. Cowan (1939) failed to see this species in the adjacent area of British Columbia, which is of essentially comparable character.

Aythya valisineria (Wilson). Canvas-back.—Ranks 10th numerically among the ducks of the region. It was recorded at 15 of the 32 lakes investigated in detail. Local ratios varied from 0.8 to 16.2 per cent; average, 4.0. The species was most common at Buffalo Bay, Lesser Slave Lake. With rare exceptions, only a few pairs were seen in any one lake. Juveniles were first noted at La Glace Lake on July 11, and thereafter were found in small numbers at scattered points north of Peace River and south of Winagami Lake.

Aythya affinis (Eyton). Lesser Scaup.—Next to the mallard, this is the most plentiful duck in the region. It was present in varying degrees of abundance at every lake visited from Baptiste Lake on the east, to British Columbia on the west, and in the lakes north of Peace River. A few were also observed in small lakes near, and within, the first range of the Rocky Mountains south-southwest of Beaverlodge. Numerical ratios varied from 6.4 to 58.6 per cent, the average being 25.3, only 1.0 per cent less than that of the mallard. The first downy young were observed at Updike Lake on July 9. From this time on, juveniles were frequently encountered; they were particularly conspicuous at Cardinal Lake during the first week in August, but every lake visited harbored considerable numbers.

Bucephala clangula (Linnaeus). American Golden-eye.—A relatively common duck, but only about one-third as numerous as the preceding species. For the most part, it is well distributed, but in various lakes, here and there, the birds appeared to be totally wanting. The species was recorded in 17 of the lakes. Relative abundance

from area to area undergoes great variation, as the local ratios ranged from 1.2 to as high as 40 per cent, the average being 8.9, as based on sample counts. It stands 5th in abundance among the ducks. The first newly hatched juveniles were met with at Sturgeon Lake on June 11. They were commonly seen after that date in other lakes, west of Kepping Lake, north of Cardinal Lake, and southward from the town of Peace River.

Bucephala islandica (Gmelin). Barrow's Golden-eye.—Extremely scarce and widely scattered. A single male was observed at Bear Lake on June 21; another at Brainard Lake July 9; and a pair at Keeping Lake the following day.

Bucephala albeola (Linnaeus). Buffle-head.—A common and widely distributed species which was recorded in varying degrees of abundance in 22 lakes. Numerically, it occupied 9th place among the ducks, with an average ratio of 4.3 per cent (min. 0.8; max. 23.0). It was found most numerous in Buffalo Bay, Lesser Slave Lake (June 8), in Sturgeon Lake (June 10 to 16), where next to the mallard it was the second most abundant duck, and at Keeping Lake, July 10. The species was definitely less common in the lakes north of Peace River and in the McLennan district, than in the Grande Prairie area and west. The first downy young of the season were noted at Saskatoon Lake on June 27. Many were met with during the following week at Sinclair and Updike lakes.

Clangula hyemalis (Linnaeus). Old-squaw.—A pair was recorded at Baptiste Lake on May 25, 26 and 27, after which the species was not again observed. The above birds were probably late migrants en route to Arctic nesting grounds.

Melanitta fusca (Linnaeus). White-winged Scoter.—This is one of the commonest ducks and is fourth in the list of relative abundance. It was seen at 26 lakes, where the ratios in relation to other ducks varied widely, from 1.0 to 38.0 per cent, the average being 11.9. The species was found relatively more numerous at Baptiste, Long, Clairmont, Cutbank, Saskatoon, Ray, Sinclair, Updike, and Cardinal lakes than in other localities.

A nest with seven eggs was found at Sinclair Lake on July 10, secreted in thick poplar woods 15 yards from the shore. Relatively small juveniles were commonly observed at Cardinal Lake in early August, and during the next two weeks at Magliore, Kimawan and Winagami lakes many larger ones were in evidence.

Oxyura jamaicensis (Gmelin). Ruddy Duck.—Of moderately common occurrence, with wide distribution, being recorded in 25 lakes. It stands seventh in the list of relative abundance among the ducks. Like all other species, it showed marked variation in relative and actual abundance from lake to lake; ratios were from 0.4 to 18.5 per cent, the average being 4.6. Highest percentages prevailed in Clairmont, Hermit, Sinclair and Mitsue lakes. On June 22, two nests were located at Hermit Lake, containing six and seven eggs, respectively, and one with 13 eggs was found at Sinclair Lake on July 6. The following day, in the same lake, the first newly hatched young were seen. During the next few days, many others were observed here and at Brainard, Updike, Keeping, Valhalla, and La Glace lakes. In August, numerous, increasingly larger immatures were seen at Cardinal, Magliore, Kimawan, Winagami, and Mitsue lakes.

Mergus merganser Linnaeus. American Merganser.—Rarely observed. The only records are: several at Baptiste Lake, May 25; a pair at Sturgeon Lake, June 11; and a pair at Winagami Lake, August 21.

Accipiter gentilis (Linnaeus). Goshawk.—Observed only at wide intervals. First noted at Ray Lake, July 4, an adult pair with a nest 20 feet from the ground in a pine tree; two immatures had left the nest and two were still in it. One immature was

collected. Two adults were noted near Pipestone Creek, Wapiti River, July 14 and 15. On July 31, a solitary example was seen near Henderson Creek, west of Spirit River, and another on August 1, a few miles south of Dunvegan.

Accipiter striatus Vieillot. Sharp-shinned Hawk.—Very rarely detected. My only records are: east end of Lesser Slave Lake, June 1; Cardinal Lake, August 5; Magliore Lake, August 14; and Lesser Slave River, north of Overlea, August 24.

Accipiter cooperii (Bonaparte). Cooper's Hawk.—A medium-sized hawk, thought to be referable to this species, was seen about halfway between Triangle and Sturgeon Lake on June 10.

Buteo jamaicensis (Gmelin) Red-tailed Hawk.—Generally, though sparingly distributed throughout the region, it was more frequently recorded around the lakes of the Grande Prairie district, and from Magliore Lake south and east to Lesser Slave Lake, than in any other areas. Southwest of Wembley to the Rockies, one or two individuals were observed almost daily. Most were in usual phase of plumage, but several melanistic individuals were also seen.

Buteo platypterus (Vieillot). Broad-winged Hawk.—On August 23, one was noted along the south shore of Lesser Slave Lake near Wagner. Within the next three days, two others were observed, one in the vicinity of Mitsue Lake, and the other a few miles south of Athabaska.

Haliaeetus leucocephalus (Linnaeus). Bald Eagle.—Not personally recorded. However, it unquestionably occurs within the territory under review, as Cowan (1939) observed it at Swan Lake, B. C., a point along the Alberta boundary a few miles northwest of Demmitt.

Circus cyaneus (Linnaeus). Marsh Hawk.—This is the commonest raptor over the region at large. One, or more, was seen almost daily en route from Athabaska to the western boundary of Alberta, in the Spirit River and Peace River parklands, and throughout most of the district visited east of the lower Smoky River, the McLennan country, and High Prairie. Individuals were less numerous in continuous wooded areas than in the Grande Prairie parklands and similar territory. On the journey southwest from Wembley to the Rocky Mountains, it was not seen beyond points 15 to 20 miles southward of Wapiti River.

Pandion haliaetus (Linnaeus). Osprey.—Only one noted throughout the summer, a single individual that frequented the eastern end of Lesser Slave Lake in late May and early June.

Falco peregrinus Tunstall. Duck Hawk.—A single bird was observed at Bear Lake, Grande Prairie, on June 23.

Falco columbarius Linnaeus. Pigeon Hawk.—Examples were recorded at widely-spaced intervals: Lesser Slave Lake, May 30 to June 7; Cutbank Lake, June 28; Wapiti River, south of Wembley, to Pinto Creek, July 15 to 18; and Winagami Lake, August 20.

Falco sparverius Linnaeus. Sparrow Hawk.—Noted very sparingly throughout most of the territory traversed. Occasionally, days would pass without observing any. Rarely more than one or two were seen in any locality. A few were in evidence for a distance of 30 to 40 miles south of Wapiti River. The birds were more regularly observed, in the latter part of August, from Magliore Lake south and east to Lesser Slave Lake, Athabaska and Edmonton.

Canachites canadensis (Linnaeus). Spruce Grouse.—In the whole of the Grande Prairie-Peace River area, the species was only once observed. This was at Ray Lake, on July 5, when an adult female was encountered with eight downy juveniles barely capable of flight. In the latter part of the month a few others were met with

along the trail from Nose Mountain southwest to Two Lakes and Torrens River. Several of the adult females were accompanied by young of the year.

Bonasa umbellus (Linnaeus). Ruffed Grouse.—Recorded sparingly from Baptiste Lake west to the British Columbia boundary, south to the Rocky Mountains and north to Cardinal and Flood lakes. Many localities were visited and wide areas covered, at times without detecting a single individual. A few juveniles, perhaps two weeks old, were seen at Saskatoon Lake on June 26, 29 and 30. An adult female with several immatures was found July 27, between Nose and Pinto creeks.

Pedioecetes phasianellus (Linnaeus). Sharp-tailed Grouse.—Apparently very scarce in the Grande Prairie-Peace River region during 1944, but reported as common, or fairly common, during certain periods in the past. My only records are two solitary birds noted near Grande Prairie (June 17), and a few miles south of Wembley (July 14), respectively. I was informed that a few inhabited the fields and prairies around Spirit River and in the area between Fairview and Cardinal Lake.

Perdix perdix (Linnaeus). European Partridge.—Numbers are now reported in the country from Edmonton north to Athabaska and westward to fields in the locality of Baptiste Lake. On my return to Edmonton in late August, a flock of 20 birds was flushed from the roadside about 10 miles west of Smith, north of the Athabaska. This is the northernmost record of *perdix* of which I have any knowledge.

Phasianus colchicus Linnaeus. Ring-necked Pheasant.—Several years ago numbers of these birds were introduced to the Grande Prairie district. They are said to have thrived in a few favorable habitats, particularly about Wembley and, to a lesser extent, Beaverlodge. The species was not personally observed.

Grus canadensis (Linnaeus). Little Brown Crane.—I was informed by local residents at Lesser Slave Lake and at various lakes in the Grande Prairie-Peace River territory that brown cranes were more or less common migrants at these points. I have no data on breeding in the region involved.

Porzana carolina (Linnaeus). Sora Rail.—Widely distributed and, in some marshes, apparently common. The species was first detected at Sturgeon Lake on June 11. It was only sparingly recorded in marshes of the Grande Prairie lakes, but it was abundant at Sinclair, Brainard, and Updike lakes. A downy juvenile was found dead in a marshy fringe of La Glace Lake on July 11. Probably fortuitously, it was not seen or heard at any point north of Peace River. One was observed at Baptiste Lake on August 25.

Fulica americana Gmelin. American Coot.—Depending upon the nature of the habitat, these birds varied from a state of scarcity to one of abundance. In some lakes they were much more numerous than most species of ducks. Very few lakes were examined in which the birds were absent. Scores of nests with eggs were found from Sturgeon Lake, June 10 to 16, to Ray Lake, July 3 to 5. In time of nesting, wide variation exists between different pairs. Thus, at Sturgeon Lake, the first observed young of the season were just hatching in early June, while others were making their appearance in lakes far to the west fully a month later. Taken as a whole, the coot may be rightly regarded as one of the commonest, breeding waterfowl of the region.

Charadrius hiaticula Linnaeus. Semipalmated Plover.—A pair was first seen at La Glace Lake on July 11. Between August 5 and 21, a few were observed daily at Cardinal, Flood, Magliore, Kimawan and Winagami lakes.

Charadrius vociferus Linnaeus. Killdeer.—A relatively common inhabitant of the region. It was recorded at nearly every lake and was also present at many ponds, creeks and rivers. South of Wapiti River, the species was detected only at Iroquois

Creek. Nests and eggs were found at Lesser Slave, Sturgeon and Bear lakes, June 1 to 23. The first newly hatched young were observed at Saskatoon Lake on June 29. Many juveniles and subadults were met with in numerous localities during the remainder of the summer.

Squatarola squatarola (Linnaeus). Black-bellied Plover.—A bird of passage, which was noted as follows: one, east end of Lesser Slave Lake, June 1; three at Cardinal Lake, August 5 to 8; six at Magliore Lake, August 14, to 16; one at Winagami Lake, August 21; and one at Baptiste Lake on August 25.

Capella gallinago (Linnaeus). Wilson's Snipe.—Apparently extremely scarce and widely scattered. A male in mating flight was noted daily at Baptiste Lake, May 25 to 28. Two were flushed immediately east of Lesser Slave Lake, in early June, and one was heard performing on the wing at the south end of Saskatoon Lake on June 27.

Bartramia longicauda (Bechstein). Upland Plover.—Only twice recorded, as follows: one at the south end of Kimawan Lake, August 18; another, eight miles north of Kinuso, below The Narrows, Lesser Slave Lake, August 23.

Actitis macularia (Linnaeus). Spotted Sandpiper.—Generally, though sparingly distributed. It was recorded at nearly all of the lakes visited and was also met with along streams of all sizes, including Lesser Slave, Smoky, Wapiti and Peace rivers. A nest with four eggs was found at Bear Lake on June 20. On July 15, three juveniles barely capable of flight were observed along Wapiti River south of Wembley. Several well-developed immatures were seen at Cardinal Lake, August 4 to 8.

Totanus melanoleucus (Gmelin). Greater Yellow-legs.—Several put in an appearance at Cardinal Lake on August 5, the only record for the season.

Totanus flavipes (Gmelin). Lesser Yellow-legs.—A common summer resident with territory-wide and nearly uniform distribution. With only a few exceptions, it was met with at all the lakes of the region. In some areas, the species was of only casual occurrence, in others, common to abundant. About the only place it was not observed embraced the heavily forested and almost lakeless country between Wapiti River and Rocky Mountains. Adults and immatures were plentiful in small flocks at Cardinal Lake, in early August, and abundant at Magliore, Kimawan and Winagami lakes, later in the month.

Erolia melanotos (Vieillot). Pectoral Sandpiper.—A small flock of six individuals was observed in association with a number of Baird's sandpipers at the east end of Lesser Slave Lake on June 1.

Erolia bairdii (Coues). Baird's Sandpiper.—On June 1, a small group, evidently the last of the spring migrants, frequented the sandy shore at the eastern extremity of Lesser Slave Lake. Small flocks were next noted at La Glace and Valhalla lakes, July 11 to 12. The birds were common at Cardinal Lake (where a specimen was taken) August 4 to 8, and, from the 13th to the 23rd of the month, varying numbers were observed at Flood, Magliore, Kimawan and Winagami lakes.

Eriois minutilla (Vieillot). Least Sandpiper.—Observed in small companies and larger flocks, from August 4 to 24, at Cardinal, Flood, Magliore, Kimawan, Winagami and Lesser Slave lakes. The birds were very common at Kimawan Lake. In most instances they were associated with *E. bairdii*.

Limnodromus griseus (Gmelin). Dowitcher.—One recorded at Sturgeon Lake, June 14; another at Sinclair Lake on July 6. Single examples and small flocks, up to 30 in number, were daily observed at Valhalla, La Glace and Buffalo lakes, from July 10 to 12. The last seen was a solitary example at Kimawan Lake on August 17.

Ereunetes pusillus (Linnaeus). Semipalmated Sandpiper.—One recorded on May 30 at the east end of Lesser Slave Lake. Not again positively identified.

Steganopus tricolor Vieillot. Wilson's Phalarope.—During June and July, observed sparingly at Grouard, and Bear, Saskatoon and La Glace lakes. Newly hatched young were found on a patch of prairie at Benson Point, Bear Lake, on June 20. In August, a few were noted at Cardinal Lake, a flock of 20 individuals at Flood Lake, and many hundreds at Winagami Lake on the 19th and 20th of August.

Larus argentatus Pontoppidan. Herring Gull.—A few subadults were seen at the east end of Lesser Slave Lake, in late May and early June, and at Winagami Lake on August 20 and 21.

Larus californicus Lawrence. California Gull.—In late May and early June, a few scattered individuals were observed: at Baptiste Lake; along the south shore of Lesser Slave Lake, south of Dog Island; at Widewater; and at Auger and Giroux bays. There is also a queried entry in the records for an individual noted at Kimawan Lake on August 17.

Larus delawarensis Ord. Ring-billed Gull.—Fairly well distributed in the region from Athabaska west to the lakes of Grande Prairie. In July, two were seen at Updike Lake and one at Wapiti River, near Pipestone Creek. During the early half of August, casuals were met with at Cardinal, Flood and Kimawan lakes. Later in the month, individuals and small flocks were commonly distributed along the south shore of Lesser Slave Lake, particularly in the vicinity of Jousard, Faust, The Narrows, Assineau and Canyon Creek.

Larus canus Linnaeus. Short-billed Gull.—Only one record, east end of Lesser Slave Lake, June 2, when one was seen with a few herring gulls.

Larus pipixcan Wagler. Franklin's Gull.—Positively identified only twice during the season; about a dozen individuals were observed at Baptiste Lake in late May and a flock of six at Flood Lake on August 13.

Larus philadelphia (Ord). Bonaparte's Gull.—Noted sparingly and irregularly in late May and early June from Baptiste Lake to Sturgeon Lake. During this period, the largest flock consisted of 28 members. The species was nowhere seen in the Grande Prairie district, or south, from mid-June to the end of July. In early August, fair numbers frequented Cardinal Lake and, a little later, a few were seen flying along Peace River. During the third week in August the birds were abundant at Kimawan and Winagami lakes, where flocks numbering as high as 1,000 to 1,500 individuals were seen. They were also common at Lesser Slave and Mitsue lakes a few days later. A high percentage of these birds were immatures of the year.

Sterna hirundo Linnaeus. Common Tern.—This was one of the rarer birds of the region. During June and July only a few pairs were seen, collectively, at Lesser Slave, Sturgeon, Sinclair, Updike and La Glace lakes. The largest number (12) was recorded at Updike Lake on July 9. On August 21 and 23, respectively, a few scattered examples were noted at Lesser Slave and Mitsue Lakes. No evidence of nesting was obtained.

Chlidonias niger (Linnaeus). Black Tern.—A relatively common to abundant, breeding, summer resident in suitable places throughout the region. It was recorded at most of the lakes. Many immatures were observed at Cardinal Lake in early August.

Zenaidura macroura (Linnaeus). Mourning Dove.—In late May, solitary examples were seen at Baptiste Lake and at the southeastern extremity of Lesser Slave Lake.

Bubo virginianus (Gmelin). Great Horned Owl.—This owl was seen, or heard, in

most localities from Athabaska to British Columbia, south to the Rocky Mountains and north of the Peace. It appeared to be nearly as common in the prairie-parklands of Grande Prairie as in the heavier mixed-wood forest. Several individuals observed at close range around Bear, Hermit, and Saskatoon lakes possessed very pale plumage and were evidently referable to *subarcticus*. Darker birds noted at Sinclair and Ray lakes, and in the heavily timbered region between Wapiti River and Torrens River, Rocky Mountains, were apparently *saturatus*. Birds of intermediate plumage were also observed in the latter region.

Asio flammeus (Pontoppidan). Short-eared Owl.—Observed only three times during the entire season: Faust, Lesser Slave Lake, June 7; and Ferguson and Bear lakes, Grande Prairie, June 20 and 21, respectively.

Chordeiles minor (Forster). Nighthawk.—Noted sparingly and irregularly throughout the entire country except in the higher and heavily forested area between the upper waters of Nose Creek and Torrens River, Rocky Mountains.

Archilochus colubris (Linnaeus). Ruby-throated Hummingbird.—Not personally detected. I was assured by local residents that the species occurs at Athabaska and at Baptiste, Lesser Slave and Sturgeon lakes. A farmer informed me that he had once seen it in the vicinity of Cardinal Lake, north of Peace River.

Megaceryle alcyon (Linnaeus). Belted Kingfisher.—Rare. One or two noted daily at Baptiste Lake in late May; one at Nose Creek, July 18, in about Latitude 54° 45' N.; one at Dunvegan, Peace River, August 1; and, a solitary example at Cardinal Lake, on August 7.

Colaptes auratus (Linnaeus). Yellow-shafted Flicker.—This is a widely distributed, breeding species which was seen in nearly all parts of the territory. In relative abundance it varied in numbers from a few casuals, in some localities, to a state of moderate prevalence in others. It was recorded daily throughout the summer except during the period spent at the higher altitudes between Nose Mountain and Torrens River. Only one was seen during three days spent in the latter locality.

Hyalotermis pileatus (Linnaeus). Pileated Woodpecker.—The unmistakable notes of one of these birds were heard at the south end of Mitsue Lake on August 24. This is the only record.

Sphyrapicus varius (Linnaeus). Yellow-bellied Sapsucker.—Moderately common from Athabaska west to Smoky River, but appreciably less numerous in the Grande Prairie parklands district where in several working localities it was not recorded. It was again more numerous in the heavily wooded country between Hythe and the British Columbia boundary. Cowan (1939: 36), with reference to it in the adjoining territory, says it is the most abundant woodpecker in the district; this does not hold for the Alberta territory to the east, where the yellow-shafted flicker is the predominant member of the family. *Varius* was seen nowhere in the higher country, south of the Wapiti, from a point southwest of Pinto Creek to the Rocky Mountains.

Dendrocopos villosus (Linnaeus). Hairy Woodpecker.—Widely distributed but scarce. One or two were noted almost daily from Athabaska to Smoky River, but it was recorded only at wide intervals in the Grande Prairie district and west to British Columbia. Not one was noted south of Wapiti River. It was again observed somewhat more frequently in the heavy woods west of Spirit River, north of the Peace, and about Kimawan and Winagami lakes.

Dendrocopos pubescens (Linnaeus). Downy Woodpecker.—Only two individuals were recorded all summer: one at Baptiste Lake, May 26, and the other at Sturgeon Lake on June 10.

Picoides tridactylus (Linnaeus). American Three-toed Woodpecker.—Recorded only

at Sturgeon Lake where four were observed in heavy coniferous forest between June 10 and 15.

Tyrannus tyrannus (Linnaeus). Eastern Kingbird.—Universally distributed in moderate numbers all over the region, with the exception of the more elevated territory from a point south of Pinto Creek, southwest to the Rocky Mountains. In some parts of Grande Prairie the birds were common, as was also the case in the parklands of Spirit and Peace Rivers and along the south shore of Lesser Slave Lake.

Sayornis phoebe (Latham). Eastern Phoebe.—From one to several of these flycatchers were observed almost daily from Athabaska west to and including most localities in the Grande Prairie district. In this general sector it was also noted at Sinclair, Updike and Ray lakes and Pipestone Creek, Wapiti River, but nowhere south and southwest of the latter stream. A few scattered individuals were seen at Cardinal Lake, Peace River, and Magliore Lake. A nest containing four well-grown nestlings was located at Sturgeon Lake on June 12. Another with five eggs was found at Bear Lake on June 20; these hatched June 23.

Empidonax flaviventris (Baird and Baird). Yellow-bellied Flycatcher.—On May 29, one was observed near the confluence of Lesser Slave and Atauwan rivers and another in poplar-spruce woods on the high sand dunes at the east end of Lesser Slave Lake, June 2.

Empidonax traillii (Audubon). Alder Flycatcher.—This species was heard, or seen, almost daily over the vast expanse of territory from Athabaska to British Columbia. It was apparently absent, or extremely scarce, in the hilly and mountainous terrain south of Wapiti River, to Torrens River. Noted several times in the woods west of Spirit River to Henderson Creek, and once at Cardinal Lake.

Empidonax minimus (Baird and Baird). Least Flycatcher.—A common summer resident in most of the region, including the parklands of Grande Prairie, Spirit and Peace rivers, and High Prairie. It was detected as far south as Nose Creek Meadows, near Nose Mountain. The last positive entry was for a male heard calling at Winagami Lake on August 20. Individuals had almost entirely given up "singing" for a full three weeks before this date.

Contopus richardsonii (Swainson). Western Wood Pewee.—Moderately common over practically the whole of the territory, including localities north of the Peace. The species was somewhat more numerous in the Grande Prairie parklands farther north. It was apparently absent from the higher ground of the mountains from Two Lakes to the Torrens River. The birds were last heard singing at Henderson Creek, west of Spirit River, on August 31.

Nuttallornis borealis (Swainson). Olive-sided Flycatcher.—Recorded almost daily from Athabaska to Smoky River but was not detected at any point in the parklands of Grande Prairie. West of this open district, however, it was occasionally noted at Ray, Sinclair and Updike lakes. It was seen or heard every day south of Wapiti River from Pipestone Creek to Torrens River where one was observed at an altitude of about 5,000 feet. No individual was heard in song after July 28. During August, one was noted at Cardinal Lake and another at Winagami Lake.

Eremophila alpestris (Linnaeus). Horned Lark.—At least a few pass through the Grande Prairie-Peace River Region during migration. Strangely enough, since the northwestern prairies appear ideal for summer occupation by these birds, not a single individual was observed throughout the season. Cowan (1939: 39) saw but one example in the Peace River District of British Columbia; it was collected May 6.

Iridoprocne bicolor (Vieillot). Tree Swallow.—A common breeder in most of the region. Observed daily in nearly every locality from May to the end of July. None

was recorded in August. Ten were seen at Two Lakes, Rocky Mountains, on July 24, the only ones noted southwest of Pinto Creek.

Riparia riparia (Linnaeus). Bank Swallow.—Observed on only one occasion, when on July 15 a flock of 14 individuals was seen flying about a steep bank at the Wapiti River a short distance east of Pipestone Creek. The presence of several nesting holes in this clay exposure indicated that the birds were breeding.

Petrochelidon pyrrhonota (Vieillot). Cliff Swallow.—Several were observed flying about over the outlet of Lesser Slave Lake on June 2; they probably intended nesting at some one of the old buildings still standing on the site of the former village of Sawridge. On August 14, six individuals were noted at Dixonville, 17 miles north of Cardinal Lake.

Progne subis (Linnaeus). Purple Martin.—Several were noted between Edmonton and Athabaska in the third week of May, and a few were recorded daily at the south end of Sturgeon Lake, June 11 to 15. To the westward of this point the species is evidently extremely rare, as the only entries are as follows: eight individuals, July 31, 12 miles west of Spirit River; a pair at Fairview, August 2; and six birds on August 3, about 10 miles north of Hines Creek.

Perisoreus canadensis (Linnaeus). Canada Jay.—Occurs in varying degrees of abundance practically throughout the entire territory westward from a point south of Athabaska. The one notable exception to this was a complete specific hiatus in the true parklands districts of Grande Prairie and Peace River. The birds were found more numerous, than elsewhere, in the coniferous forest south of Wapiti River to Two Lakes and Torrens River, Rocky Mountains; in the territory westward from Hythe to the British Columbia border; and, in only a slightly lesser degree, at Clear Hills and Cardinal, Flood, Kimawan and Winagami lakes.

Cyanocitta cristata (Linnaeus). Blue Jay.—Observed daily at Baptiste Lake in late May. Not again recorded until July 15, when one was seen at Wapiti River, south of Wembley. Thirteen days later another was met with at Iroquois Creek, six miles south of Wapiti River. The only other record for this far western Alberta territory concerns one observed about 14 miles north of Grimshaw, August 13. This is apparently the northernmost record of the species in this longitude. It is not listed by Cowan (1939) or Rand (1944). On the return journey in late August, a few were noted along the southeast shore of Lesser Slave Lake, at Mitsue Lake, and between this point and Athabaska.

Pica pica (Linnaeus). American Magpie.—Encountered only at Baptiste Lake (late May) and at two or three points north to Smith and westward to Lesser Slave River (August).

Corvus corax (Linnaeus). Northern Raven.—This species was rarely observed. My only records are: Sinclair Lake, July 9; and Kimawan, Winagami and Lesser Slave lakes, August 17 to 23.

Corvus brachyrhynchos Brehm. American Crow.—Observed almost daily, usually in small numbers, throughout the entire territory. As a general rule, no more than one to two or three pairs were seen in any one day. However, the birds were more common in a few localities: around the eastern end of Lesser Slave Lake; at Deep, Cutbank and La Glace lakes; and in the Spirit River district. A flock of 120 individuals was recorded at La Glace Lake on July 11. Several good-sized flocks were also seen, on August 1, between Spirit River and Fairview. At a nest under observation at Bear Lake, the immatures began leaving on June 21.

Parus atricapillus Linnaeus. Black-capped Chickadee.—Sparingly, but almost universally distributed in the region. The only territory in which the species was

not recorded was that lying at the higher elevations from about Two Lakes to Torrens River, Rocky Mountains. Its place was taken here by *hudonicus*.

Parus hudonicus Forster. Brown-headed Chickadee.—Observed in few localities. In late July, the birds were common in the heavy coniferous forest from Nose Mountain southwest to Torrens River. The only other localities in which they were seen were Baptiste and Sturgeon lakes, May and June, and at Winagami and Mitsue lakes in the latter part of August.

Sitta canadensis Linnaeus. Red-breasted Nuthatch.—It occurred in moderate numbers at Baptiste, Lesser Slave and Sturgeon lakes, and was common to abundant, at the height of summer, in the heavier coniferous forest southwest of Pinto Creek to the slopes of the Rockies at Torrens River. During late August a few were met with in stands of spruce at Winagami and Mitsue lakes, and along Lesser Slave River en route to Smith.

Troglodytes aedon Vieillot. House Wren.—Observed almost daily in nearly all working localities throughout the region. The only blank in the records concerns the country traversed, in the latter half of July, from about Pinto Creek southwest to Torrens River. Undoubtedly breeds wherever observed. Males were last heard singing during the second week of July.

Telmatodytes palustris (Wilson). Long-billed Marsh Wren.—Recorded in the following localities: West end of Lesser Slave Lake, including Buffalo Bay; Sturgeon, Clairmont, Ferguson, Hermit, Sinclair, Brainard, La Glace, and Magliore lakes. The birds were more abundant at Sinclair Lake (July 6 to 8) than elsewhere, where they were commonly nesting and in full song. It was not listed by Cowan (1939).

Turdus migratorius Linnaeus. American Robin.—Robins were met with in varying degrees of abundance all over the region. A few were seen even in the mountain valleys and subalpine forests from Nose Mountain to Two Lakes and Torrens River. Nests with full complements of eggs were seen at Baptiste and Lesser Slave lakes in late May and early June.

Hylocichla guttata (Pallas). Hermit Thrush.—Locally common, but rather capriciously distributed. It was noted regularly at Baptiste Lake, occasionally along Lesser Slave Lake, and daily at Sturgeon Lake. It was recorded nowhere in the true parklands of Grande Prairie, but was found fairly numerous in the mixed-wood forests west of Hythe and south of Wapiti River to about Nose Mountain (about Lat. 54° 35' N.). An immature was taken at Magliore Lake on August 15. A nest with four eggs was found in poplar-spruce woods at Baptiste Lake on May 25.

Hylocichla ustulata (Nuttall). Olive-backed Thrush.—Not detected until June 4, when we reached Giroux Bay on the south shore of Lesser Slave Lake. Here the species was fairly numerous in heavy mixed-wood forest and was in full song. During the second week of June the birds were common at Sturgeon Lake where two specimens were collected. They were moderately well represented at Saskatoon Lake, in the heavily wooded district westward from Hythe, and from south of Wapiti River to the Rockies. One was noted at Cardinal Lake, August 7. Individuals were heard singing up to the third week of July.

Sialia currucoides (Bechstein). Mountain Bluebird.—Comparatively rare. The only ones recorded during the summer were: east end of Lesser Slave Lake; Hythe; Sinclair Lake; Pinto Creek, and Pipestone Creek. On July 29, four were seen a few miles west of Spirit River. In early August, family groups were recorded near Clear Hills and a short distance north of Grimshaw.

Regulus satrapa Lichtenstein. Golden-crowned Kinglet.—During the second week of June, singing males were occasionally noted at Sturgeon Lake, and a pair was seen

in a muskeg at Sinclair Lake on July 7 and 8. During the latter half of July, the species was common in the coniferous forests from Pinto Creek southwest to the Torrens River Valley, Rocky Mountains. No songs were heard at this time. In late August, a few were observed at Kimawan and Winagami lakes.

Regulus calendula (Linnaeus). Ruby-crowned Kinglet.—On the whole, notably scarcer than the preceding species. A few individuals in voluble song were recorded at Baptiste and Sturgeon lakes, during late May and the second week of June, respectively. Silent birds were noted in July at Sinclair and Ray lakes and at widely scattered points from Wapiti River to the Rocky Mountains.

Bombycilla garrulus (Linnaeus). Bohemian Waxwing.—A pair of waxwings, tentatively referred to this species, was seen flying along the east shore of Flood Lake on August 13.

Bombycilla cedrorum Vieillot. Cedar Waxwing.—Generally distributed, but nowhere notably common. Observed in most working localities from Baptiste Lake west to Keeping Lake and for about 20 miles southwest of Pipestone Creek, Wapiti River. Nowhere was it detected in the higher region of foothills and mountains in the latter direction. In August, a few were seen daily at Cardinal and Flood lakes, and intervening territory, southward to Lesser Slave Lake, Smith, Athabaska and Edmonton.

Vireo solitarius (Wilson). Blue-headed Vireo.—One or two were heard, or seen, daily at Sturgeon Lake, June 10 to 15, and likewise at Ray, Updike and Sinclair lakes, July 3 to 9.

Vireo olivaceus (Linnaeus). Red-eyed Vireo.—Common from Athabaska and Baptiste Lake westward to Sturgeon Lake, but less numerous in the Grande Prairie district and west to the British Columbia border. It was traced south of Wapiti River to about Nose Mountain, but not recorded anywhere in the foothills and mountains to the southwest. In late July, and during August, it was sparingly observed: from Grande Prairie to Spirit River; west to Henderson Creek; at several points north of Peace River to Flood Lake; and southeast to Lesser Slave and Mitsue lakes. The last regular songs were heard at Cardinal Lake on August 8.

Vireo philadelphicus (Cassin). Philadelphia Vireo.—The only record was of a singing male observed at Baptiste Lake on May 26.

Vireo gilvus (Vieillot). Warbling Vireo.—Fairly common and well distributed from Athabaska west to Sturgeon Lake and Smoky River, but nowhere seen or heard in the parklands-farming area of Grande Prairie. Occasional birds were noted in the heavily wooded country westward from Hythe to Keeping Lake and a few in mid-July at Wapiti River and southwest to Iroquois Creek. The last songs were heard at this time. Probably owing to the fact that singing had ceased in late July and August, the species was not noted anywhere in the Spirit and Peace River areas. A single individual was seen at Kimawan Lake on August 18.

Mniotilta varia (Linnaeus). Black and White Warbler.—Commonly distributed from Athabaska to a point west of Smoky River, but rare in the semi-open country of Grande Prairie where it was observed only at Saskatoon Lake. In the heavily wooded country to the west, the species was sparingly noted every day. South of Wapiti River it was traced through widely-spaced individuals to the region of Nose Mountain. On August 13, one was seen a few miles north of Cardinal Lake. No songs were heard after July 19.

Vermivora peregrina (Wilson). Tennessee Warbler.—These birds were common to abundant from Athabaska to the limits of heavier forests west of Smoky River but

were nowhere recorded in the Grande Prairie district. In early July, a few were noted at Sinclair and Ray lakes where the males were still singing.

Vermivora ruficapilla (Wilson). Nashville Warbler.—Several recorded at Kimawan Lake on August 17 and 18, in company with magnolia and myrtle warblers.

Dendroica petechia (Gmelin). Yellow Warbler.—Fairly common throughout the entire region from Edmonton to Athabaska and west to British Columbia. In travelling southwest from Wapiti River, below Wembley, it was observed only as far as Pinto Creek. The species was noted in all localities northward from Grande Prairie to Clear Hills and Flood Lake, and southward to Lesser Slave Lake. A nest with four eggs was found at Bear Lake on June 20; these hatched four days later. Songs were heard up to August 4.

Dendroica magnolia (Wilson). Magnolia Warbler.—Rarely encountered. Two singing males were met with in heavy mixed-wood forest at the northeastern angle of Lesser Slave Lake on May 30 and 31. Casually observed between Pinto Creek and Torrens River, Rocky Mountains, July 17 to 25. During the third week of August numbers were seen at Kimawan and Winagami lakes.

Dendroica tigrina (Gmelin). Cape May Warbler.—Several singing males were met with at Baptiste Lake, Lesser Slave River, Lesser Slave Lake, and Sturgeon Lake, between May 25 and June 13.

Dendroica coronata (Linnaeus). Myrtle Warbler.—Common from late May to mid-June from Baptiste Lake to Sturgeon Lake and Smoky River. The species was absent from the farming-parklands area of Grande Prairie but was occasionally noted westward from Hythe and southwest of Wembley to the Rocky Mountains. The birds were fairly common in the latter part of August from Magliore Lake south and east to Lesser Slave Lake and Athabaska. The last songs of the season were heard near Nose Mountain on July 17.

Dendroica virens (Gmelin). Black-throated Green Warbler.—Rare, and apparently confined to the eastern part of the region. On June 5, one was heard singing in deciduous-coniferous forest south of Faust, Lesser Slave Lake. At least two different males were recorded at Sturgeon Lake between June 10 and 15; both were in full song and observed at a distance of a few yards. The last record is of a male seen on the edge of a spruce muskeg at Kimawan Lake on August 17.

Dendroica castanea (Wilson). Bay-breasted Warbler.—Met with only in early June along the northeast shore of Lesser Slave Lake, Giroux Bay at Faust, and Sturgeon Lake. One was collected south of Faust on June 7. Males were heard singing in all of these localities.

Dendroica striata (Forster). Black-poll Warbler.—Of rather casual occurrence from Athabaska west to the heavy forest east of Grande Prairie. Several were noted in every working locality between these two points. It was not detected in the true parklands of the Grande Prairie area but was noted regularly in the thickly wooded district west of Hythe and Valhalla. Three were seen between Pinto Creek and Nose Mountain. The last singing was recorded on July 18.

Seiurus aurocapillus (Linnaeus). Oven-bird.—A relatively common breeding bird throughout the territory from Athabaska west to Sturgeon Lake and the wooded fringe of Grande Prairie. Not once recorded in the latter area, but in the thickly wooded territory west of it to British Columbia the species was recorded daily. One was observed at Cardinal Lake on August 8. Its ringing song was last heard at Sinclair Lake on July 7.

Seiurus noveboracensis (Gmelin). Water-thrush.—Occurs in moderate numbers over a wide geographical range. It was recorded in the following localities: Baptiste

Lake; throughout the length of Lesser Slave Lake; Sturgeon Lake; Ray, Sinclair and Updike lakes; and occasionally at Iroquois, Pinto and Nose creeks, south of Wapiti River. Singing was last heard on July 28.

Cf. orornis agilis (Wilson). Connecticut Warbler.—Observed in the same localities as the preceding species, with the exception of the places mentioned south of Wapiti River. It was, perhaps fortuitously, seen nowhere in the latter territory. Singing continued until at least the second week in July.

Oporornis philadelphia (Wilson). Mourning Warbler.—In late May and early June, observed with fair regularity from Baptiste Lake to Sturgeon Lake, at which time the males were commonly in song.

Oporornis tolmiei (Townsend). Macgillivray's Warbler.—Two were observed on July 26 along Nose Creek north of Nose Mountain Meadows, and another the following day near Pinto Creek.

Geothlypis trichas (Linnaeus). Yellow-throat.—Observed in numerous localities from Baptiste Lake west to, but not within, the Grande Prairie parklands. West of this, however, it was detected sparingly in the wooded, lake district between Hythe and the western border of Alberta. On July 19 and 26, one was observed at Two Lakes, Rocky Mountains. Three days later another male was seen and heard singing at Iroquois Creek.

Setophaga ruticilla (Linnaeus). American Redstart.—A common and widely distributed species which was recorded almost daily in varying numbers from Athabaska to British Columbia, except within the Grande Prairie district. It was nowhere recorded south of Wapiti River, or north of Peace River, except at Flood Lake. On August 17 and 18, several were observed at Kimawan Lake. Singing was regular until the second week of July.

Passer domesticus (Linnaeus). English Sparrow.—Generally distributed in towns and villages and about farm buildings throughout the settled parts of the region. Occasionally noted in wooded areas.

Sturnella neglecta Audubon. Western Meadowlark.—On previous brief and hurried trips to the Grande Prairie-Peace River Region, this species had not been observed. However, in the season of 1944, it was found in several localities in full song, and evidently breeding. Records are as follows: June 17, 10 miles west of Smoky River; June 18 and July 1 and 2, in grassy fields on the eastern outskirts of the town of Grande Prairie; Clairmont, Ferguson, Bear, Hermit, Cutbank and Saskatoon lakes, June 18 to 30; near North Buffalo Lake, July 12; and August 1, about two miles north of Dunvegan, the only individual observed north of the Peace.

Xanthocephalus xanthocephalus (Bonaparte). Yellow-headed Blackbird.—Noted only at the west end of Lesser Slave Lake, and at Sturgeon, Clairmont, Ferguson and Hermit lakes. In the three latter localities, the species was fairly common.

Agelaius phoeniceus (Linnaeus). Red-winged Blackbird.—A common to abundant breeder in suitable localities throughout the entire region. Its abundance was particularly marked at Clairmont, Ferguson, Saskatoon, Sinclair and La Glace lakes. A few were seen along creeks south of Wapiti River and as far south as Two Lakes in the Rocky Mountains. The species was sparingly noted north of the Peace at Cardinal and Flood lakes, and south of it at Magliore Lake. Fair-sized flocks were noted at Baptiste Lake on August 25.

Icterus galbula (Linnaeus). Baltimore Oriole.—This bird was met with occasionally from Edmonton to Athabaska and west to Grande Prairie. In the latter area it was specifically recorded at the town of Grande Prairie and at Bear, Deep and Saskatoon lakes. It was not recorded by Cowan (1939) in the Peace River country of British Columbia.

Euphagus carolinus (Müller). Rusty Blackbird.—Not positively identified anywhere during the early part of the summer. From August 15 to 23, small groups and fairly large flocks were noted at Magliore, Kimawan, and Winagami lakes, and at intervals along the road to Triangle, High Prairie and Lesser Slave Lake.

Euphagus cyanocephalus (Wagler). Brewer's Blackbird.—Noted daily in comparatively small numbers from Edmonton to Athabaska and west to Lesser Slave Lake. In June and early July, the species was nowhere seen in the Grande Prairie area east, south, or west of Bear Lake, but later in the month a few were encountered about Valhalla, La Glace and Buffalo lakes and along Wapiti River in the vicinity of Pipestone Creek. In late July and early August, considerable numbers were seen in flocks from Henderson Creek (west of Spirit River) northeast via Dunvegan and Fairview to Cardinal Lake. On August 25 and 26, flocks were also met with between Smith and Edmonton. It was not observed by Cowan (1939).

Quiscalus g. versicolor Vieillot. Bronzed Grackle.—Generally, though sparingly, distributed from Edmonton to Athabaska and west to British Columbia. They were more common about the lakes of Grande Prairie. It was not recorded south of the Wapiti or north of Peace River.

Molothrus ater (Boddaert). Cowbird.—As a rule, these birds were found fairly commonly, from spring until mid-July, in most of the territory westward from Athabaska to British Columbia. A few were seen southwest of Pipestone Creek to about Pinto Creek, but from there on to the Rockies they were apparently absent. In late July, two were recorded west of Spirit River and several a few days later at Cardinal Lake.

Piranga ludoviciana (Wilson). Western Tanager.—Found sparingly over a wide territory from Athabaska to Ray Lake. Exact localities are: Baptiste Lake; Lesser Slave Lake (northeast shore and Giroux Bay); Sturgeon and Ray lakes; Pipestone Creek to Pinto Creek; and Henderson Creek, west of Spirit River. Males were heard singing until early July.

Pheucticus ludovicianus (Linnaeus). Rose-breasted Grosbeak.—During late May and early June these loud songsters were heard, or seen, along the road from Edmonton to Athabaska, at Baptiste Lake and along Lesser Slave Lake as far west as Giroux Bay. It was not detected at other points in the region, but Cowan (1939: 55) records it as a fairly abundant, breeding bird in the Peace River District of British Columbia. Undoubtedly a few, at least, occur in the more heavily wooded country of Alberta west of Grande Prairie.

Carpodacus purpureus (Gmelin). Purple Finch.—Except in the extreme eastern part of the territory, where it was more numerous, it was recorded very sparingly from Athabaska west to Ray and Keeping lakes. One was seen at Henderson Creek on July 31, and another on August 18 at Kimawan Lake. It was observed nowhere south of Wapiti River, and last singing was heard on July 6.

Spinus pinus (Wilson). Pine Siskin.—Encountered irregularly in small numbers from Lesser Slave Lake west to the British Columbia boundary, and rarest in the Grande Prairie area. In the latter half of July the birds were common in the coniferous forests between Pinto Creek and the Rockies at Torrens River. During August, pairs and small groups were observed in the Spirit River district, northward to Clear Hills and Cardinal Lake, and southeast to Lesser Slave Lake.

Spinus tristis (Linnaeus). Goldfinch.—Rare throughout the region; no more than 18 were observed during the entire season. It was recorded at the following points: Lesser Slave Lake (east end and Giroux Bay); town of Peace River; and a few miles north of Grimshaw.

Passerculus sandwichensis (Gmelin). Savannah Sparrow.—Over most of the territory, the predominant breeding sparrow. It was recorded daily in all parts of the region traversed, with the exception of that area lying between Pinto Creek and Torrens River, where it was observed only in the meadow at the eastern member of Two Lakes. The birds were particularly abundant in the grasslands about all the lakes of Grande Prairie and at Magliore, Kimawan and Winagami lakes. The final songs were heard about the middle of July. Three eggs in a nest at Bear Lake on June 20 hatched two days later. It already contained a cowbird fledgling several days old.

Passerherbulus caudacutus (Latham). Leconte's Sparrow.—This secretive and elusive sparrow was seldom detected. The only places in which its presence was positively established were: east end of Lesser Slave Lake; Ray, Sinclair, Updike, Keeping and La Glace lakes; near Hine's Creek; and Winagami Lake.

Ammospiza caudacula (Gmelin). Nelson's Sparrow.—Noted only at Lawrence Lake, May 29, and Brainard and Keeping lakes, July 9 and 10. This is apparently a rare sparrow. However, owing to its inconspicuousness, stealth and weak voice, often rendering detection difficult, it may be more common and widely dispersed than the above records would seem to indicate.

Poocetes gramineus (Gmelin). Vesper Sparrow.—By no means common, but geographically widespread from the Edmonton-Athabaska district west to British Columbia. Ordinarily it was not observed in any of the heavily timbered territory but was found relatively well represented in such open or semi-open country as: High Prairie; Grande Prairie; prairie-parklands north and south of the Peace; and the farmlands between Smoky River and Kimawan Lake. Occasionally noted along roads intersecting wooded terrain, or along sandy shores of lakes and streams in the same type of territory, such as at Lesser Slave Lake and Peace River. The species was heard singing until the third week of July.

Junco hyemalis (Linnaeus). Slate-colored Junco.—A relatively common and widely distributed species that was met with in nearly every part of the region, excepting the true parklands of Grande Prairie, Spirit and Peace rivers. The species was very common in the territory lying between Wapiti River and the Rocky Mountains. In the subalpine spruce forest of Torrens River Valley, it was noted well above an altitude of 4,000 feet.

Spizella passerina (Bechstein). Chipping Sparrow.—In late May and early June, moderately common from Edmonton to Athabaska and west to Sturgeon Lake. Nowhere observed in the open parklands country of Grande Prairie, or west of there to the British Columbia border. However, a few were seen daily, during the latter half of July, while we were travelling between Pipestone Creek, Wapiti River, and Torrens River in the Rockies. At the end of July and in early August numbers were noted: in the Saddle Hills; west of Spirit River to Henderson Creek; and north and east of Clear Hills and Cardinal Lake.

Spizella pallida (Swainson). Clay-colored Sparrow.—Observed in nearly all parts of the region from Edmonton and Athabaska west to British Columbia. More numerous throughout the upland grass and shrubby areas of Grande Prairie than elsewhere. North of Saddle Hills, it was recorded in the Spirit River parklands farming country west to Henderson Creek and north of the Peace, between Fairview and Cardinal Lake and several miles farther north. This sparrow was also observed daily in small numbers from the town of Peace River, south to Magliore and Kimawan lakes.

Zonotrichia leucophrys (Forster). White-crowned Sparrow.—This sparrow was seldom seen. Solitary singing males were met with at Bear, Saskatoon, Sinclair and

Updike lakes, June 23 to July 9. The species was doubtless breeding at these points. Individuals were found at widely spaced intervals from Pinto Creek to Torrens River, during the latter half of July.

Zonotrichia albicollis (Gmelin). White-throated Sparrow.—Common and apparently uniformly distributed from Athabaska west to Grande Prairie. In the latter area it was scarce; only a few individuals were noted at Saskatoon Lake. Fairly common in the heavily wooded country between Hythe and the western boundary of Alberta and also over most of the route from Wapiti River to Two Lakes, Rocky Mountains. One was observed in the Saddle Hills. The species was noted daily, during August, in small numbers from Clear Hills, Flood and Cardinal lakes, southward to Lesser Slave Lake. No singing was heard after July 26.

Passerella iliaca (Merrem). Fox Sparrow.—In early June, this brilliant singer was fairly common in the wilderness along the south shore of Lesser Slave Lake and at Sturgeon Lake. In the Grande Prairie district it was exceedingly scarce, being recorded only at Saskatoon Lake. In the western part of the province, beyond Hythe, it was again tolerably common and still in full song on July 10. Three were seen between Pipestone and Pinto creeks, but none southward from there. It was last seen at Henderson Creek on July 30 and 31.

Melospiza lincolni (Audubon). Lincoln's Sparrow.—Recorded sparingly in most working localities, and occasional intervening points, from Baptiste Lake to Sturgeon Lake. Detected nowhere in the Grande Prairie parklands, it was noted daily west of there in small numbers. It was also seen between Iroquois Creek and the upper Nose Creek Valley near Two Lakes. Casuals were observed at Henderson Creek, and Cardinal, Magliore and Kimawan lakes. Individuals were still singing at the end of July.

Melospiza georgiana (Latham). Swamp Sparrow.—Observed with relative infrequency; over large areas it was neither seen nor heard. The daily field record book carries entries for the following localities only: Sturgeon, Sinclair, Updike and Ray lakes; Iroquois, Pinto and Henderson creeks; and Magliore and Kimawan lakes. The last song was heard on July 30.

Melospiza melodia (Wilson). Song Sparrow.—Observed throughout the entire territory from Edmonton and Athabaska west to Ray Lake. It was fully as common about the lakes of Grande Prairie as in the territory to the east but was very scarce in the heavily wooded district to the west. One was heard singing at Pinto Creek on July 28. It was also recorded at Henderson Creek, Cardinal Lake, Peace River, and Magliore, Kimawan and Winagami lakes.

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MIXED BIRD PARTIES IN THE TROPICS, WITH SPECIAL
REFERENCE TO NORTHERN RHODESIA

BY J. M. WINTERBOTTOM

In a previous paper (1943), I gave an account of the woodland bird parties [flocks] of the Barotse and Eastern Provinces of Northern Rhodesia and suggested that most of the species found in them fell into two categories: "nucleus" species, always found in parties, either mixed or pure; and "circumference" species, which formed the mixed parties, as a rule, by attaching themselves to parties of "nucleus" species. This method of formation is not invariable, since mixed parties are sometimes found without any nucleus species, or with two or more nucleus species. I also suggested that while both protection and the disturbance caused by the party were possible reasons for their formation, neither was likely to be of as great value as had sometimes been supposed. While nucleus species often communicated the alarm from one individual to another of their own species, other members of the party often paid little attention; the advantage of disturbance depended greatly on the feeding habits of the species concerned and this, for some common members (woodpeckers) of bird parties, was *nil*.

A most important study, based on very detailed and abundant data, has been published by D. E. Davis (1946). Stanford's paper (1947) on the bird parties in Northern Burma revealed the essential similarity of Asiatic and African bird parties. Davis, although no more successful than the rest of us in giving a really convincing explanation of the reason for this flocking habit, has written a most illuminating paper on their "natural history." He divided birds found in the bird parties into "regular" and "accidental," the former being, as the name implies, normally found in bird parties and only abnormally outside them, while the latter only join the flocks occasionally and are normally found outside them. I divided the members of the African bird-parties into two categories also, "nucleus" and "circumference," and Davis is inclined to equate these with his "regular" and "accidental" species, respectively. If I understand his definitions correctly, however, this is not the case, though the drongo, *Dicrurus a. adsimilis*, is, as Davis pointed out, a typical "accidental" species. The other common "circumference" species, such as *Dryoscopus*, *Batis* and *Sylvietta* are "regular" in Davis's sense. Apart from *Dicrurus* which occupies a unique position, a number of other African species occur as "accidentals" in bird parties, but they are infrequent and do not seem to me to affect the theoretical implications. An example from

Northern Rhodesia is the two individuals of *Pycnonotus tricolor* and two of *Uraeginthus angolensis* included in the Fort Jameson party of January 5, 1939, and listed in my previous paper. Even the most frequent of such "accidentals" in Northern Rhodesia does not occur in more than three per cent of the parties. In Brazil, however, they seem to form a more numerous category, since Davis found that in the Boa Fé forests *Ilicura militaris* occurred in about eight per cent of the parties, and four accidental species in the Comari forests occur in more than five per cent of the parties. The distinction brought out by Davis, therefore, is an important one. In conformity with this discussion, we may divide up the species composing bird parties into four categories:

- (i) "Nucleus" species, apparently much more important in the African savannah and Burmese forests than in South American forest.
- (ii) Other "regular" species.
- (iii) "Regular accidental" species, of which *Dicrurus* is the only certain example, but the American *Drymophila* may also fall into this category.
- (iv) "Accidental" species.

A possible fifth category, "Accidental nucleus" species, of which an example is the helmet shrike, *Prionops poliocephala*, normally forming parties of its own but sometimes joining mixed parties or being joined by a few other species, may be justified on further analysis.

Davis also discussed the possible origin of the habit of forming mixed flocks. He remarked, "It has often been tacitly assumed that the flocks of birds are formed in response to the food supply aroused by the army ants" and it is certain that both army ants and their African counterparts, the driver ants, are accompanied by parties of birds. In the case of the driver ants, however, this only applies to forest. In Northern Rhodesia, I have never seen birds accompanying driver ants. The reason for this is, I think, that driver ants seldom forage in direct, bright sunlight. In forest where the canopy shields them, they can and do forage at any time of day, but in the woodland and open grass country present in Northern Rhodesia, driver ants forage almost entirely at night. When encountered in the daytime, they are almost invariably in "column of route" and not searching for food. When I first began to study bird parties, I commented on the birds accompanying ants in a letter to Mr. R. E. Moreau. He replied that at Amani the species that accompanied driver ants were quite distinct from those forming the ordinary bird parties. Davis (*op. cit.*) stated "the mixed flocks described in these forests rarely accompanied army ants," but he also noted that these ants were rare in the area. He suggested, however, that "it is conceivable that the flocks which exist in the absence of ants are a further step in the evolution of flocks

and that the flocking behavior first developed in relation to ants and then continued even in the absence of ants." This is a most attractive hypothesis and deserves further study by ornithologists in an area where army and driver ants are regularly accompanied by birds.

One point about the advantages of the flocking habit which I overlooked in my last paper, but which is clearly brought out by W. C. Allee (1938), is the "confusion effect" on predators of the simultaneous presence of a considerable number of prey. While I still remain doubtful that, in mixed bird parties, the aggregations afford any protection to the members, either by an intimidating influence on predators or from an increased vigilance due to so many pairs of eyes, the "confusion effect" is probably an actual one and of real advantage.

The flocks with which the present paper is chiefly concerned are those of the Southern Province of Northern Rhodesia, in an area geographically between those where the previously studied flocks were found. In all, 169 bird parties were noted, divided between the months as follows: January (7); February (12); March (21); April (24); May (16); June (15); July (15); August (16); September (16); October (5); November (18); December (4).

Although no special effort was made to analyze exactly the same number of parties in each month, I believe the low figures for October and December do represent a lower incidence of parties. It is significant that the breeding seasons of the first six species, listed below in order of frequency, are at their height in October, and the fledged young of these birds are abroad in considerable numbers in December.

As compared with the other areas in Northern Rhodesia, studied in the previous paper, it might be expected that the Southern Province, being geographically intermediate, would show intermediate features in the composition of the bird parties found there. This, as a glance at Table 1 will show, is only partly true. The more varied terrain of the Southern Province may perhaps in part account for this, for in addition to most of the woodland types found in the other two areas, the more open Acacia woodland, which does not extend into Barotse-land or the Eastern Province, occupies a good deal of the area. One of the most striking differences between the present area and those previously studied was in the comparative abundance of the various "nucleus" species. The most abundant of such species in the Southern Province is the black tit, *Parus niger*, a bird which occurs comparatively infrequently in the other areas. In this connection, it should be noted that I am regarding as one unit, the true black tit and the larger *insignis* which at present is considered a different species;

both occur within the Barotse boundaries, *niger* in the south and *insignis* in the north. *Insignis* occupies most of the Eastern Province, though *niger* occurs in the extreme south and in the Luangwa Valley. Only *niger* has been collected, thus far, in the Southern Province, but it is possible *insignis* may occur in the north and west. The only other species recorded there is the grey tit, *P. cinerascens*, in 10

TABLE 1
COMPARISON OF NORTHERN RHODESIAN BIRD PARTIES

	Barotse	Southern	Eastern	Category
Number of parties	65	169	42	—
Total species recorded	61	64	53	—
Species per party	9.9	7.8	7.7	—
<i>Dicurus adsimilis</i>	88 per cent	84 per cent	88 per cent	(iii)
<i>Batis molitor</i>	63	57	74	(ii)
<i>Dendropicos fuscescens</i>	20	36	64	(ii)
<i>Dryoscopus cubla</i>	61	66	36	(ii)
<i>Eremomela scolops</i>	40	19	60	(i)
<i>Oriolus monacha</i>	34	20	29	(ii)
<i>Prionops poliocephala</i>	25	18	24	(i)
<i>Anaplectes rubriceps</i>	23	15	31	(ii)
<i>Sylvietta rufescens</i>	52	43	17	(ii)
<i>Zosterops senegalensis</i>	20	37	17	(i)
<i>Pogoniulus chrysocornus</i>	34	16	14	(ii)
<i>Campephaga flava</i>	29	16	2	(ii)
<i>Rhinopomastus cyanomelas</i>	18	22	24	(ii)
<i>Parus niger</i>	12	52	21	(i)
<i>Oriolus auratus</i>	21	31	7	(ii)
<i>Petronia supercilii</i>	23	30	7	(ii)

parties (six per cent). A third species, *P. rufiventris*, occurs in the east and west. The total percentage for all *Parus* species added together is 37 in the Eastern Province and 34 in Barotseland, both figures being well below that for *P. niger* only, in the Southern Province.

The second in abundance of the nucleus species was the white-eye, *Zosterops senegalensis anderssoni*, which occupied the same relative position in the Barotse and Eastern provinces but was considerably less abundant there. The green-cap eremomela, *E. scolops pulchra*, came third, but it was markedly less abundant than in the areas previously studied.

The relative abundance of the two orioles was reversed in the Southern Province, and the numerical abundance there of the rock sparrow, *Petronia supercilii*, may be noted.

The cardinal woodpecker, *Dendropicos fuscescens hartlaubi*, occupied an intermediate position as between Barotseland and the Eastern Province. The percentage for all woodpeckers was 53, still below the Eastern Province figures for *Dendropicos*.

The total number of species noted, in the 169 parties analysed, was 64, only three more than in the 65 Barotse parties, while in the number of species per party (7.8), the Southern Province agreed closely with the Eastern Province.

Of the Palaearctic migrants found in the parties, the commonest in the Southern Province, as elsewhere, was the willow-warbler, *Phylloscopus trochilus*, but it was even commoner than it was in the east, occurring in 22 parties (13 per cent). The spotted flycatcher, *Muscicapa striata*, occurred nine times.

Considering all 276 parties together, the ten most frequent species were:

1. Fork-tailed drongo (*Dicrurus adsimilis*), 236.
2. Chin-spot flycatcher (*Batis molitor*), 169.
3. Puff-back shrike (*Dryoscopus cubla*), 167.
4. Black tit (*Parus niger*), 105.
5. Cardinal woodpecker (*Dendropicos fuscescens*), 100.
6. Rufous-bellied crombec (*Sylvietta rufescens*), 95.
7. Green-cap eremomela (*Eremomela scotops*), 86.
8. Yellow white-eye (*Zosterops senegalensis*), 79.
9. African golden oriole (*Oriolus auratus*), 69, and
Rock sparrow (*Petronia superciliaris*), 69.

It will be noticed that only three species occurred in more than 50 per cent of the parties, and that none of these was a nucleus species of which there were three in the first ten places, numbers 4, 7 and 8.

A vast amount of work still remains to be done in the field of bird flocks and mixed parties. What, for instance, of territory? E. M. Nicholson (1931) implied that mixed bird parties in forests of British Guiana are confined to well-defined localities in their wanderings, but there is no explanation of why they should be. I have three times seen encounters of flocks of helmet shrikes, *Prionops poliocephala*, in Northern Rhodesia followed by incidents that looked like territorial skirmishing, but such reactions seem unlikely to occur in mixed parties. We need more mapping of a party's wanderings. Again, we need detailed observations of how the parties are built up at the beginning of the day and how, and how far, they disperse in the evenings. I have implied that nesting tends to prevent the formation of mixed parties, but it does not do so entirely; I have seen such a party pass the nest-hole of a cardinal woodpecker, *Dendropicos fuscescens*, when opportunity was taken by the parents to effect a change-over on the nest. I have already mentioned the need for additional observations on the relationship, if any, of bird parties and ants. There is no information about the vertical zonation of the species comprising bird

parties, a point likely to be of special interest in forest. Curiously enough, we still await any detailed study of mixed parties in temperate regions where, even though the parties may be a less conspicuous feature of the bird life, the ornithologists are more numerous than in the tropics.

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CRITICAL PERIODS AND CAUSES OF DEATH IN AVIAN
EMBRYONIC DEVELOPMENT

BY ALEXIS L. ROMANOFF

AVIAN embryonic mortality has long been a subject of biological interest. It is also a problem of obvious economic importance. The total embryonic mortality of domestic fowl, *Gallus gallus*, has been progressively increasing for some time. Less than 30 years ago, when flocks were small and kept at large, the embryonic death rate rarely exceeded 10 per cent. As simple and primitive methods of poultry management have been replaced by such efficient modern practices as intensive feeding, breeding in confinement, and large-scale artificial incubation, embryonic mortality has frequently risen to 25 per cent or more.

Numerous investigations have attempted to determine the causes of death during the incubation period, and to explain the rising embryonic death rate. Studies have been made not only of chickens, but also of a number of other domestic birds and some game birds raised in captivity.

DISTRIBUTION OF MORTALITY

In 1919, Payne pointed out a fundamental fact regarding embryonic mortality in the fowl when he published his data on the distribution of deaths throughout the period of incubation. His observations of 2,142 dead embryos indicated that mortality is especially high between the third and fifth days, and again on approximately the nineteenth day. He also found that artificially incubated embryos were much more likely to die during the later period of susceptibility than embryos incubated under the hen. This discovery immediately suggested that environmental factors were at fault, an inference that has subsequently been borne out by the results of many studies.

Later, Riddle (1930) extended Payne's findings on embryonic mortality to include doves, *Streptopelia risoria*, and pigeons, *Columba livia*. Although the incubation periods of doves, pigeons, and chickens are of different lengths, the curves of embryonic mortality are nevertheless similar for all three species. Two peaks are seen at essentially equivalent points, one early in embryonic life, the other shortly before the hatching date. In fact, avian development in general is characterized by these two periods of increased mortality. Data on turkeys, *Meleagris gallopavo*, ducks, *Anas platyrhynchos*, pheasants, *Phasianus torquatus*, grouse, *Bonasa umbellus*, and quail, *Colinus virginianus* (Romanoff, 1934 and unpublished ms.; Romanoff, Bump, and Holm,

1938) substantiate this statement. In pheasants and quail, the embryonic death rate is probably lower under natural conditions than it is when these birds are incubated artificially. It should be noted that quail, when raised in captivity, are subject to a third period of increased embryonic mortality approximately at the midpoint of incubation.

GENERAL CAUSES OF EMBRYONIC MORTALITY

From the above observations on the distribution of embryonic mortality, two questions logically follow. Why do avian embryos tend to die at certain ages, rather than at others? What are the principal causes of death?

At the outset, it may be stated that gross structural abnormalities and teratism account for a relatively small percentage of embryonic deaths. Various studies have demonstrated this fact. Byerly (1930) examined approximately 2,000 dead chicken embryos and found that only about eight per cent of them were terata. Hutt (1930) detected only 559 malformed embryos (3.1 per cent) in 17,700 eggs that failed to hatch. Of the various types of anomalies that he identified, hyperencephaly, microphthalmia and exencephaly were most frequent.

Some monstrosities evidently arise from genetic causes, but it is probable that a much greater number are induced by the conditions of incubation. Dareste (1891), Stockard (1921), and others have shown that various abnormalities may result when the rate of embryonic development is retarded or accelerated, especially if interference occurs in the early stages of incubation. The developmental rate has been altered experimentally by subjecting the embryo to the influence of ether, alcohol fumes, narcotics, various gases, abnormal temperatures, restricted or excessive amounts of oxygen, and excessive quantities of carbon dioxide.

Only eight types of monstrosities in birds are known to be the result of genetic lethal characters. Death in the first half of the incubation period is the result of three of these characters: dominant creeper (Cutler, 1925), recessive white (Dunn, 1923a), and the "talpid lethal," which produces malformed extremities (Cole, 1942). Development continues until later in the incubation period in the presence of any of the remaining characters—recessive abnormal upper mandible (Asmundson, 1936), homozygous short legs (Landauer, 1935), diplopodia (Taylor and Gunns, 1947), simple recessive "stickiness" (Byerly and Jull, 1932), and incompletely dominant "crested" in ducks, *Anas platyrhynchos* (Rust, 1932). Ordinarily, lethal characters account for a very insignificant proportion of embryonic deaths and

are likely to be present only in inbred flocks. Byerly, Knox, and Jull (1934), as well as others, have shown that inbreeding increases embryonic mortality at both critical periods, but to a greater extent late in incubation.

In addition to structural anomalies leading to the death of the embryo, there are also malpositions that may contribute to mortality. Malpositions become evident at or near the end of incubation and are of several types. Hutt (1929) observed that 56 per cent of all chick embryos dead at 18 to 20 days were in abnormal positions. There are at least four malpositions that make hatching extremely difficult or impossible, either because the chick's head is turned so that the air in the air cell is inaccessible, or because movement is so restricted that the chick is incapable of striking the shell, or because of a combination of both reasons. It is possible that a very strong chick is occasionally able to overcome the respiratory handicap. However, no chick can hatch if its head is buried between its thighs, a malposition which has been found in nine per cent (Hutt, 1929) to 13 per cent (Sanctuary, 1925) of all embryos dead in the final stages of incubation. It is interesting to note that the incidence of malpositions may be increased considerably by various environmental factors, such as abnormal temperature (Romanoff, Smith, and Sullivan, 1938) and an excess of atmospheric carbon dioxide (Romanoff and Romanoff, 1933). These findings indicate that, as Dove (1935) suggested, malpositions are not always the primary cause of death, but may be secondary to unfavorable environmental conditions or other lethal factors. Heredity probably plays but a small part as a cause of malpositions.

CAUSES OF DEATH AT CRITICAL PERIODS

A number of explanations have been advanced to account for the peaks in the mortality curve which are present early and late in incubation. Riddle (1930) suggested that the first critical period was caused by respiratory maladjustments before the establishment of the special respiratory surfaces (area vasculosa, chorio-allantois) that appear during the first three or four days. Carbohydrates are the chief source of energy for the embryo at this time, as the high respiratory quotient indicates (Bohr and Hasselbalch, 1903), and carbon dioxide perhaps accumulates in sufficient quantity to prove fatal. It has also been pointed out (Tomita, 1921) that there is a maximum concentration of lactic acid at a time when the enzyme decomposing lactic acid is present in very small amount. Needham (1926) noted that nitrogen, early in the developmental period, is excreted largely in the form of ammonia which is very toxic to the embryo (Dareste, 1891).

According to Boyden (1927), hydronephrosis possibly results from mechanical obstruction of the mesonephros as this organ begins to function.

In the late critical period, death may perhaps be caused by failure to make a proper transition from allantoic to pulmonary respiration, as Brody (1927) suggested. Pohlman (1919) and Dunn (1923b) noted poor development of the hatching muscle (*musculus complexus*) as a contributing factor. In artificial incubation, deficient oxygenation may result if the oxygen tension of the air becomes too low (Arbuckle, 1918). If the eggshell is highly permeable and the relative humidity is too low, excessive evaporation from the egg may lead to water-starvation (Riddle, 1921). It should also be pointed out that, at the end of the developmental period, the cumulative effect of all unfavorable conditions may be felt, with the result that the viability of the embryo is lowered. Abnormal changes in the physicochemical state of the embryonic fluids are especially important.

The middle critical period, previously mentioned as characterizing the embryonic development of quail in captivity, ordinarily does not appear unless birds are fed a diet deficient in animal proteins (certain amino acids), minerals (especially calcium), or vitamins. Byerly, Titus, and Ellis (1933) noted a pronounced increase in embryonic mortality halfway through the incubation period in flocks fed diets of vegetable origin exclusively. Smith (1930) found that the middle critical period became evident in winter, if birds received insufficient amounts of sunshine or vitamin D, and disappeared if they were given cod liver oil or were irradiated with ultraviolet light. According to Adamstone (1931), a lack of vitamin E in the egg, although increasing mortality most frequently on the fourth day of incubation, is sometimes responsible for death at about the eleventh day. A deficiency of riboflavin in the hen's diet is particularly likely to lead to embryonic deaths in the midperiod of incubation and increases their incidence at the other critical periods as well (Lepkovsky, Taylor, Jukes and Almquist, 1938). The distribution of deaths caused by riboflavin deprivation, however, depends upon the relative lack of the vitamin in the egg. The major peak in the mortality curve falls at a progressively earlier date as the degree of vitamin deficiency increases (Romanoff and Bauernfeind, 1942).

Some abnormalities of growth in riboflavin-deficient embryos may be mentioned. In general, body weight in such embryos is consistently below normal. Embryos that die in the middle critical period may weigh from 20 to 90 per cent of normal. Those that survive until the final stages of incubation tend to fall into two distinct groups,

those that weigh less than 40 per cent of normal, and those that weigh about 90 per cent of normal. It appears that some embryos, before dying, pass through a prolonged period of morbidity, during which their growth is greatly retarded. Other embryos evidently develop at more nearly normal rates and die very suddenly.

It may be of interest to add that the oxygen consumption of the moribund embryo, whatever the cause of eventual death, often provides a clue to the embryo's condition (Romanoff, 1940). Although abnormally large amounts of oxygen may be used by some embryos (usually those that die in the last critical period, probably when they go through a death struggle), the oxygen consumption of the dying embryo is frequently less than normal for several days before death (Romanoff, 1941). In addition, there is a linear relationship between the percentage reduction in oxygen consumption and the percentage retardation in growth.

CONCLUSION

Embryonic deaths in birds occur principally at three critical periods which, in the chicken, fall on the third to fifth, twelfth to fourteenth, and eighteenth to twentieth days of incubation, respectively. The appearance of three peaks in the embryonic mortality curve is, so far as is known, specific to birds. The causes of death at each critical period are more or less distinctive, and many of them are specific for Aves.

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*Agricultural Experiment Station, Cornell University, Ithaca, New York,
May 6, 1948.*

SUCCESS OF MARSH HAWK NESTS IN NORTH DAKOTA

BY MERRILL C. HAMMOND AND C. J. HENRY

DURING the early history of the Lower Souris National Wildlife Refuge a research program was instituted by the Fish and Wildlife Service to determine the most important elements affecting the nesting of ducks on the Souris marshes. The following notes, the results of observations on marsh hawks, *Circus cyaneus*, made incidental to studies of nesting ducks, were made principally in the years 1937, 1938, and 1939. Mr. Joseph Hickey kindly gave considerable assistance in tabulating and organizing the data.

When a nest was located, it was marked and the pertinent information recorded. If not too far out of the way, the nest was revisited periodically, until it was destroyed or the young large enough to band. At some nests the observations were continued until the young were able to fly. We were successful in banding 150 young birds. Of these, returns were received on only 12, or 8 per cent; Table 1 gives a brief summary of them.

TABLE 1
RETURNS FROM 150 MARSH HAWKS Banded ON LOWER SOURIS REFUGE,
NORTH DAKOTA

Date banded	Date recovered	Fate	Place	Approximate distance in miles and direction
June 21, 1937	Sept. 11, 1937	Shot	Everman, Texas	1025—S
June 24, 1937	Nov. 20, 1937	"Found"	Lolita, Texas	1375—S
July 2, 1937	Dec. 5, 1940	Shot	Hepler, Kansas	800—SSE
July 5, 1937	Dec. 27, 1937	Shot	Lowrey, La.	1350—SSE
July 5, 1937	Mar. 9, 1938	Killed	Michoacan, Mexico	2050—S
July 5, 1937	Nov. 26, 1937	Shot	Ranger, Texas	1025—S
July 10, 1938	June 21, 1945	Shot	Underwood, N. Dak.	80—SSW
July 10, 1938	Aug. 14, 1938	Shot	Edgewood, Brit. Columbia	800—WNW
Sept. 21, 1938	Sept. 7, 1942	Shot	Butte, N. Dak.	50—S
June 22, 1939	Nov. 1, 1940	Shot	Waelder, Texas	1325—S
June 28, 1939	Mar. 9, 1940	Shot	Edcouch, Texas	1550—S
June 26, 1941	Jan. 23, 1943	Shot	Terry Co., Texas	1075—S

When nests were not located until after the young were hatched, only those with broods of "average" size were included for computing average. Even so, the averages of clutch size are undoubtedly slightly lower than the true average due to the fact that a few eggs or young birds were probably removed before we discovered the various nests. This belief is supported by the fact that the clutches averaged smaller in 1937, a year of relatively high nest-loss.

Likewise, the average hatch recorded was smaller than the true average, since the parent birds removed some dead young from the nests before the fate of all eggs was determined. Neither was there any way of telling the total hatch when there were young in the nests on the date of discovery. In the latter case, small broods were excluded from the hatch data, but "average" broods were included.

The average number of young surviving to various ages is reasonably accurate but is based upon relatively few observations of the older broods. Average ages of broods were estimated from known laying or hatching dates, or from degree of plumage development.

TABLE 2
BREEDING-CYCLE CHRONOLOGY, VICINITY OF UPHAM, NORTH DAKOTA

	1937	1938	1939
<i>Spring arrival dates</i>	March 19	March 16	March 23
<i>First nests started</i>	about May 13	about April 26	about May 7
<i>Last nests started</i>	May 22	about May 30	about June 1
<i>First hatches</i>	about June 3	about May 20	about June 1
<i>Last hatches</i>	June 15	June 20	about June 25
<i>Young able to fly</i>	July 8 to 20	June 15-July 15	July 5 to 30

Additional arrival dates—March 12, 1940 (some wintered in 1939-40); March 24, 1941; March 24, 1943; March 12, 1946; March 22, 1947.

TABLE 3
NESTING SUCCESS OF MARSH HAWKS

<i>Clutch size</i>	1937	1938	1939	Total
<i>Total nests with complete clutches</i>	31	16	13	60
<i>Total eggs in complete clutches</i>	151	84	68	303
3 eggs	1	0	0	1
4 eggs	8	3	1	12
<i>Range, nests having</i> 5 eggs	17	6	8	31
6 eggs	4	7	4	15
7 eggs	1	0	0	1
<i>Mean number of eggs per clutch</i>	4.87	5.25	5.23	5.05
<i>Standard deviation</i>	0.806	0.774	0.599	0.768
<i>Nests and eggs hatched</i>				
<i>Total nests with complete histories</i>	35	14	11	60
<i>Total nests hatched</i>	23	11	9	43
<i>Percent of nests hatched</i>	66	79	82	72
<i>Total young hatched</i>	91	48	36	175
1 young	1	0	0	1
2 young	1	0	1	2
3 young	5	2	1	8
<i>Range, nests having</i> 4 young	9	4	5	18
5 young	5	4	1	10
6 young	2	1	1	4
<i>Mean number in hatched nests</i>	3.96	4.36	4.00	4.07
<i>Standard deviation</i>	1.186	0.924	1.118	1.099

TABLE 4
SURVIVAL OF YOUNG IN NESTS THAT HATCHED*

Period of observation	1937			1938			1939			Total		Standard deviation
	broods	young	average	broods	young	average	broods	young	average	broods	young	average
31-35 days	7	20	2.86	3	11	3.67	1	4	4.00	11	35	3.18
26-30 days	8	24	3.00	3	11	3.67	4	15	3.75	15	50	3.33
21-25 days	12	36	3.00	6	22	3.67	7	25	3.57	25	83	3.32
16-20 days	18	64	3.56	10	39	3.90	-7	25	3.57	35	128	3.66
11-15 days	21	76	3.62	10	43	4.30	8	29	3.62	39	148	3.79
6-10 days	23	88	3.83	11	48	4.36	9	36	4.00	43	172	4.00
0-5 days	23	91	3.96	11	48	4.36	9	36	4.00	43	175	4.07
												1.100

* Table does not indicate total survival under headings "broods" and "young." These data are on nests at which observations were continued to the ages indicated in column 1. The average sizes were obtained from the total observations of each brood size.

The following records of nests give some information on egg-laying and incubation, further illustrating the irregularities of the nesting period cited by Bent (United States Nat. Mus. Bull. 167, 1937).

(1) A nest in 1937 (no. 2) contained one egg on May 14 and 15, six on May 25 and June 3, seven on June 9; one young hatched June 15, three young and one pipped egg in nest on June 23. If all the eggs were laid by the same female, this represented a laying period of 20 or 21 days and a probable sporadic incubation period of 30 or 31 days on one egg.

(2) Another nest in 1937 (no. 10) contained two eggs on May 22, three eggs on May 24, four eggs on May 27, and five eggs on June 11, a laying period of seven or eight days for five eggs.

(3) A nest in 1938 (no. 2) contained one egg on May 3, two eggs May 5, four eggs May 11, six eggs May 16, a laying period of at least 10 days.

A few records indicate that between 30 and 40 days elapse between the date the first egg is layed and the date of first hatch. The hatching period may include at least eight days, or all the young may hatch within a few days.

As recorded by Bent, most young could fly a little at 30 days of age and fly well at 35 days.

TABLE 5

APPROXIMATE HATCH AND SURVIVAL, ALL NESTING ATTEMPTS (1937, 1938, 1939)

	Number of broods observed	Total nests represented by broods observed	Young observed*	Average for all nests	Standard deviation
<i>Hatched</i>	43	60	175	2.92	2.069
<i>Banding age</i> (16-20 days)	35	51	128	2.51	1.943
<i>Fledged</i> (31-35 days)	11	16	35	2.19	1.759

* See Table 3 for nest success; 68 per cent of nests observed held at least one or more young to banding and fledgling ages.

TABLE 6

RELATION OF CLUTCH SIZE TO BROOD SIZE AT 16-20 DAYS OF AGE (1937, 1938, 1939)

<i>Eggs in clutch</i>	<i>Number of records for each brood size</i>						<i>Nests de- stroyed or failing to hatch</i>	<i>Number of nests not checked</i>	<i>Total</i>
	1	2	3	4	5	6			
3		1							1
4	1	1	3	2			4	1	12
5		2	4	7	6		8	4	31
6		1	1	3	3	1	1	5	15
7			1						1
<i>Total</i>	1	5	9	12	9	1	13	10	60

Fish and Wildlife Service, Upham, North Dakota, January 19, 1948.

FIVE NEW BIRDS FROM THE PHILIPPINES

BY E. THOMAS GILLIARD

COMPARATIVE studies connected with the preparation of an annotated list of the birds of Bataan revealed the existence of the following unnamed races from localities elsewhere in the Philippines.

In the past it was thought that *Rallus torquatus* inhabited the whole of the Philippine archipelago, but now, having brought together 30 specimens from the old American Museum, the Rothschild and the recently acquired Bataan collections, it is clear that three very distinct races inhabit the islands, two of which remain to be named: 1) a small race from southern Luzon and Marinduque; 2) a long-billed race with distinct head pattern from Mindanao.

The nominate race was described by Linnaeus (1766) from a specimen which undoubtedly was taken in the vicinity of Manila.

Lowe's *R. t. maxwelli* (Bull. Brit. Orn. Club, vol. 65, p. 5, 1944) from "New Guinea?" is probably an example of *R. t. torquatus*. It is based on a single bird obtained alive in Manila and described after its death February 29, 1944, in the London Zoo. The characters given for *maxwelli*, determined by comparing the specimen with published descriptions, are not comparable to those of either of the races hereunder described.

Rallus torquatus quisumbingi new subspecies

TYPE: Adult male; Amer. Mus. Nat. Hist. no. 93476; Camarines, southern Luzon, Philippine Islands; July 10, 1902; collector unknown.

DIAGNOSIS: Nearest to *torquatus* of central and northern Luzon but males with considerably shorter wings and tail (see table of measurements).

MEASUREMENTS: The type has wing, 143.5 mm., tail, 58, bill from side, 35.

	Wing	Tail	Bill from side
<i>Males</i>			
5 adults, vicinity Manila, Luzon	152-161 (156)	61-64 (63)	35-39 (37.7)
3 adults, Camarines	137-146 (142)	50-58 (53.3)	35-36 (35.3)
1 adult, Zamboanga, Mindanao	153.5	61	43.5
<i>Females</i>			
1 (?), 3 subadults, vicinity of Manila	142-147 (145.3)	58-60 (59.5)	29-33 (31.5)
2 adults, Camarines	142 (142)	53-56 (54.5)	34-35 (34.5)
2 adults, Zamboanga and Ayala, S. W. Mindorao	140-156 (148)	54-55 (54.5)	35-38 (35.6)

RANGE: The province of Camarines, southern Luzon, and Marinduque Island.

DISCUSSION: All but one of the specimens from Camarines and Marinduque have outer edges of primaries, secondaries, rump and tail brighter, more brownish, less olive.

Although females of *torquatus* before me are chiefly subadult, their wings and tails average larger than those of *quisumbingi*.

A single adult female from the island of Marinduque agrees reasonably well with the series from Camarines in coloration and measurement. An adult male from Mindoro Island, however, is similar to *torquatus* and must be included in the range of that form; it has wing, 153 mm., tail, 59, bill from side, 39.

This barred rail is named in honor of my esteemed friend, Dr. Eduardo Quisumbing, Director of the National Museum of the Philippines.

***Rallus torquatus sanfordi* new subspecies**

TYPE: Adult male; Amer. Mus. Nat. Hist. no. 545237; Rothschild Collection; Zamboanga, Mindanao, Philippine Islands; May, 1903; collected by Walter Goodfellow.

DIAGNOSIS: Nearest to *torquatus* but differs by reason of longer, stouter bill (see list of measurements under *R. t. quisumbingi*) and black eye-stripe without a white dorsal emargination.

MEASUREMENTS OF THE TYPE: Wing, 153.5 mm.; tail, 61; bill from side, 43.5.

RANGE: Known only from Ayala and Zamboanga on the extreme southwestern tip of Mindanao.

DISCUSSION: Both the *sanfordi* and *quisumbingi* series were collected during 1902 and 1903. The brownish coloration described for the latter is not present in *sanfordi*. Therefore, it is evidently a valid character and not due to "foxing."

It is with pleasure that I name this race in honor of Dr. Leonard C. Sanford who has done so much through the years to bring about a better understanding of the ornithology of the Pacific.

Two major populations of *Megalaema haemacephala* inhabit the Philippines: 1) *intermedia*, a crimson-throated race which is known from the central islands of Cebu, Guimaras, Masbata, Negros, Romblon and Tablas; and 2), a yellow-throated group which occurs throughout the remainder of the Philippines and which, until very recently, was thought to represent a single race, *haemacephala*.

A study of 65 examples of the latter, from localities throughout the major geographical blocks of its extensive range, indicates that four morphological characters appear to vary geographically. In order of importance they are: 1) length of bill; 2) length of wing; 3) length of

tail; and 4) color of throat. Generally speaking, northern birds have the shortest bills, longest wings and tails and the most pallid throats. Southward, on the island of Mindanao, the coloration of the throat is brightest. In fact, the underparts are generally brighter yellow. The population of this island has recently been segregated as *mindanensis* by Rand (*Fieldiana*, 31 (25): 202-203, 1948). Specimens at hand from Leyte and Samar differ from *mindanensis* by having underparts similar to northern birds, but they differ from all in length of bill, wing and tail.

In view of these differences, it becomes necessary to fix a precise type locality for *M. h. haemacephala* described by P. L. S. Müller from the "Philippine Islands" (*Natursyst. Suppl.*, 1776: 88).

Since a long series from Lamao, Bataan, is very similar to two specimens from Locos Norte, northern Luzon, where this race achieves its greatest wing length and shortest bill, I designate Lamao, Bataan, as the type locality of *M. h. haemacephala*.

The Samar-Leyte population is defined as follows:

***Megalaema haemacephala celestinoi* new subspecies**

TYPE: Adult female; Amer. Mus. Nat. Hist. no. 647243; Rothschild Collection; Bonga, Samar, Philippine Islands; June 27, 1896; collected by J. Whitehead.

DIAGNOSIS: Very similar to *haemacephala* of Mindoro and Luzon, but with longer bill, shorter wing and tail. See list of measurements.

MEASUREMENTS OF THE TYPE: Wing, 77.5 mm.; tail, 33; bill, 18.

No difference has been noted between males and females, and the measurements are grouped in the following table. Bill measurements are made from the anterior edge of the nostril.

MEASUREMENTS			
	Wing	Tail	Bill
<i>haemacephala</i>			
2, Locos Norte, N. Luzon	83-90 (86.5)	36.5-37.5 (37.0)	15(2) (15.0)
11, Lamao, western C. Luzon	83-88 (85.0)	36-38.5 (37.5)	15-16.5 (15.5)
5, Infanta, eastern C. Luzon	82-86.5 (84.0)	35.5-37 (36.3)	16-17 (16.3)
9, Sorsogon, S. Luzon	81-86.5 (83.8)	33-37.5 (35.6)	16-17.5 (16.8)
5, Mindoro	81-85 (82.6)	34.5-36 (35.1)	14.5-16 (15.3)
<i>celestinoi</i>			
2, Samar and Leyte	77.5-79.5 (78.5)	33 (33.0)	18 (18.0)
<i>mindanensis</i>			
6, S. Mindanao	80-85 (82.2)	32.5-36 (33.9)	15.5-17.5 (16.5)

RANGE: Samar and Leyte. This race is named for Mr. Manuel Celestino, veteran collector of the National Museum of the Philippines

and wonderful field companion. Mr. Celestino is the son of Andres Celestino who collected for many years with J. Whitehead and R. C. McGregor.

With 38 examples of *Chrysocolaptes lucidus* from north, central and south Luzon before me, it is apparent that several distinct populations inhabit the island. A series from Benguet, northern Luzon, averages larger than do series from central and southern Luzon. Yet, in coloration, they agree well with a long series from Bataan, western central Luzon. Specimens from Laguna de Bai, Cavite, Mt. Maguiling in central Luzon and a series from the province of Sorsogon in southern Luzon have richer brown chests. The specimens from Sorsogon have the shortest wings and tail.

The type locality of Wagler's *haematribon* (Syst. Av., 1827: sp. 95) is India. Peters (Birds of World, 6: 227, 1948) lists it as "India? = Luzon." In view of the differences noted above, it is now necessary to be more precise. I, therefore, designate Lamao, Bataan, as the type locality of *C. l. haematribon*.

Chrysocolaptes lucidus ramosi new subspecies

TYPE: Adult male; Amer. Mus. Nat. Hist. no. 94131; Sorsogon, southern Luzon, Philippine Islands; April 7, 1903; collected by Dr. E. H. Porter.

DIAGNOSIS: Nearest to *haematribon* but males with the chest considerably more brownish, less grayish olive and with shorter wing and tail. See table of measurements.

MEASUREMENTS: The type has wing, 138.5 mm., tail, 82, bill from anterior edge of nostril, 32.5.

MEASUREMENTS

	Wing	Tail	Bill from side
3 males, Sorsogon	138.5-140.0	76-82	31.0-32.5
1 female, Sorsogon	144	85	30
4 males, C. Luzon	141.5-145.0	81-89	29.5-35.0
2 females, C. Luzon	138	78	26.0-28.5
6 males, Lamao, Bataan	140-147	80.5-89.0	31-33
7 females, Lamao, Bataan	137-144	79.0-85.5	29-32
4 males, Benguet, N. Luzon	142.5-150.0	85.0-91.5	32.5-35.0
2 females, Benguet, N. Luzon	147.5-148.0	86.0-89.5	32.5-33.0

RANGE: Southern Luzon north to the vicinity of Laguna de Bai.

DISCUSSION: Specimens from Marinduque Island have not been seen. They should be more nearly like *ramosi* than *haematribon* on the basis of geographical distribution.

Hachisuka (Contrib. Birds of Philippines (2): 179, 1930) in his description of *C. l. grandis* from Polillo Island states that that race "—can be distinguished at once by its large measurements." He gives these as wing, 154–156 mm., tail, 102–103. It is apparent, therefore, that the race *grandis* is not similar to *ramosi* despite the fact that it is browner below than *haematribon*.

C. l. rufopunctatus of Samar is so decidedly different from *ramosi* from Sorsogon that a diagnosis is unwarranted.

This new crimson-backed woodpecker is named in honor of my friend and mentor, Dr. Norberto de Ramos, who with his charming wife, Aurora, did so much to make our Bataan Expedition a success.

It is clear that 16 examples of *Mulleripicus funebris* at hand from various Luzon localities represent two distinct races: 1) *funebris* of central Luzon, a black-billed, short-tailed form with profuse white crown-spotting; and 2) a northern race, to be described below, which has an ivory bill, long tail and subobsolete white crown-spotting.

To *M. f. funebris*, described by Valenciennes (Dict. Sci. Nat., Levrault, 40: 179, 1826) from the "Philippine Islands," I assign Mt. Maguiling, Laguna, Luzon, as type locality.

***Mulleripicus funebris mayri* new subspecies**

TYPE: Adult male; Amer. Mus. Nat. Hist. no. 552523; Rothschild Collection; Cape Engano, northern Luzon, Philippine Islands; April 27, 1895; collected by J. Whitehead.

DIAGNOSIS: nearest to *funebris*, but maxilla yellowish ivory, not black; crown and occipital white spotting subobsolete, not bright and profuse; white spots of chin, throat and neck smaller; tail and bill longer. See list of measurements.

MEASUREMENTS: The type has wing, 159 mm., tail, 130, bill from anterior edge of nostril, 31.5.

MEASUREMENTS

	Wing	Tail	Bill from nostril
1 male, Cape Engano, N. Luzon	159.0	130.0	31.5
1 female, Isabella, N. Luzon	156.0	130.5	28.0
6 males, Bataan, W. Central Luzon	155–160	113.0–126.5 (4)	28.5–30.0
3 females, Bataan, W. Central Luzon	155–161	116–118.5 (2)	29 (2)
1 male, Mt. Maguiling, E. Central Luzon	161.5	116.0	27.5
1 female, Mt. Maguiling, E. Central Luzon	154.0	121.5	25.5

RANGE: Northern Luzon in the Isabella and Cape Engano region and probably southward to the mountain provinces.

DISCUSSION: A series of six males and four females from the original lowland forests of Bataan are intermediate in coloration of plumage but closer to *funeris* which is found in forests to eastward across the bay. However, they have the ivory bill of *mayri*.

This handsome new ivory-billed race is named for Dr. Ernst Mayr, Curator of the Whitney-Rothschild Old World collections, to whom I am deeply indebted for constant encouragement and technical instruction.

American Museum of Natural History, New York, January 31, 1949.

TWENTY-FOURTH SUPPLEMENT TO THE AMERICAN
ORNITHOLOGISTS' UNION CHECK-LIST
OF NORTH AMERICAN BIRDS¹

THE present supplement covers proposals for change in name or status, or for addition, that have been accepted by the Committee as of the end of the year 1948. It is published in accordance with instructions from the Council of the Union.

To expedite the work of extensive revision of ranges required for the Fifth Edition of the Check-List, Herbert Friedmann has been designated Vice-Chairman of the Committee on Classification and Nomenclature.

Committee	ALEXANDER WETMORE, Chairman
	HERBERT FRIEDMANN, Vice-Chairman
	FREDERICK C. LINCOLN
	ALDEN H. MILLER
	JAMES L. PETERS
	ADRIAAN J. VAN ROSSEM
	JOSSELYN VAN TYNE
	JOHN T. ZIMMER

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4. *Colymbus nigricollis* Brehm 1831 is antedated by *Colymbus caspicus* Hablizl, Neue Nordische Beyträge, vol. 4, 1783, p. 9. (Bay of Enzeli, Caspian Sea, Iran.) The Eared Grebe, therefore, will be known as *Colymbus caspicus californicus*. See Stresemann, Ibis, 1948, pp. 473-474.
10. *Puffinus pacificus cuneatus* Salvin becomes *Puffinus pacificus chlororhynchus* Lesson, as the breeding birds of San Benedicto Island are inseparable from those of the Australian region. *Puffinus chlororhynchus* Lesson, Traité d'Orn., livr. 8, June, 1831, p. 613. (No locality given; type from Shark's Bay, western Australia.) See Hellmayr and Conover, Cat. Birds Amer., Field Mus. Nat. Hist., Zool. Ser., vol. 13, pt. 1, no. 2, August 18, 1948, pp. 66-67.
20. *Sula nebouxi* becomes *Sula nebouxii nebouxii*. Change in spelling conforms to original publication. Trinomial name is required because of an extralimital subspecies recognized from the Galápagos Islands. See Todd, Proc. Biol. Soc. Washington, vol. 61, April 30, 1948, p. 49.
37. *Branta canadensis parvipes* (Cassin). ATHABASKA CANADA GOOSE. [172 g.] *Anser parvipes* Cassin, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, no. 5, 1852, p. 187. (Vera Cruz.) Additional subspecies. Alaska to Baffin Island, south to northern British Columbia and Manitoba, in migration to California, México and Louisiana. See Aldrich, Wilson Bull., vol. 58, 1946, pp. 98, 101; Hellmayr and Conover, Cat. Birds Amer., Field Mus. Nat. Hist., Zool. Ser., vol. 13, pt. 1, no. 2, 1948, pp. 302-303.
40. *Anser albifrons flavirostris* Dalgety and Scott. GREENLAND WHITE-FRONTED GOOSE. [171 b.] *Anser albifrons flavirostris* Dalgety and Scott, Bull. Brit. Orn. Club, vol. 68, no. 6, May 7, 1948, p. 115. (North Slob, Wexford,

¹ The Twenty-third Supplement was published in The Auk, vol. 65, no. 3, July, 1948, pp. 438-443.

- Eire.) Additional subspecies. Breeds on the western coast of Greenland; in migration to Ireland and Scotland. One banded in Greenland shot on the St. Lawrence River, Quebec.
47. *Anas crecca nimia* Friedmann. ALUTIAN TEAL. [138 a.] *Anas crecca nimia* Friedmann, Proc. Biol. Soc. Washington, vol. 61, September 3, 1948, p. 157. (Kiska Island, Aleutian Islands, Alaska.) Additional subspecies. Aleutian Islands from Akutan westward.
 58. *Melanitta deglandi* (Bonaparte) again recognized as specifically distinct from *Melanitta fusca*. See W. DeW. Miller, Amer. Mus. Nov. no. 243, 1926, p. 2; Hellmayr and Conover, Cat. Birds Amer., Field Mus. Nat. Hist., Zool. Ser., vol. 13, pt. 1, no. 2, August 18, 1948, p. 393.
 60. *Mergus serrator* Linnaeus becomes *Mergus serrator serrator* through recognition of the following subspecies.
 60. *Mergus serrator major* Schiøler. GREENLAND RED-BREASTED MERGANSER. [130 a.] *Mergus serrator major* Schiøler, Danske Orn. Tidskr., vol. 19, no. 4, December, 1925, p. 115. (West Greenland.) Additional subspecies. Coasts of Greenland. See Hellmayr and Conover, Cat. Birds Amer., Field Mus. Nat. Hist., Zool. Ser., vol. 13, pt. 1, no. 2, 1948, p. 408.
 104. *Charadrius mongolus mongolus* Pallas becomes *Charadrius mongolus stegmanni*. Stresemann, Orn. Monatsb., vol. 48, no. 2, April 22, 1940, p. 55; new name for *Charadrius mongolus littoralis* Stegmann, Orn. Monatsb., vol. 45, no. 1, January 4, 1937, p. 25 (Bering Island), preoccupied by *Charadrius littoralis* Bechstein, Gem. Nat. Deutschl., vol. 4, 1809, p. 430, pl. 23.
 117. *Calidris canutus rufus* becomes *Calidris canutus rufa* as the generic name is of feminine gender.
 132. *Larus fuscus graellsii* Brehm restored to the list on basis of a specimen from Qôrnoq (near Godthaab), Greenland. See Hørring and Salomonsen, Medd. om Grønland, Bd. 131, no. 5, 1941, p. 52, footnote.
 188. *Colaptes chrysoides* becomes *Colaptes chrysoides* to conform to original spelling. The forms, therefore, will be listed as follows:
Colaptes chrysoides mearnsi Ridgway.
Colaptes chrysoides brunnescens Anthony.
Colaptes chrysoides chrysoides (Malherbe).
 189. *Hylatomus* Baird becomes *Dryocopus* Boie, as the New World species are not separable generically from those of the Eastern Hemisphere. See Peters, Check-list Birds World, vol. 6, 1948, pp. 150-151, 154.
Dryocopus Boie, Isis von Oken, Bd. 2, 1825, col. 977. Type, by monotypy, *Picus martius* Linnaeus. The forms will stand as follows:
Dryocopus pileatus abieticola (Bangs).
Dryocopus pileatus pileatus (Linnaeus).
Dryocopus pileatus floridanus (Ridgway).
Dryocopus pileatus picinus (Bangs).
 190. *Centurus aurifrons incanescens* Todd. NORTHERN GOLDEN-FRONTED WOODPECKER. [410 a.] *Centurus aurifrons incanescens* Todd, Ann. Carnegie Mus., vol. 30, December 16, 1946, p. 298. (12 miles south of Marathon, Brewster County, Texas.) Additional subspecies. Western and central Texas to northeastern Chihuahua and northern Coahuila. See Wetmore, Wilson Bull., vol. 60, 1948, pp. 185-186.
 197. *Dendrocopos pubescens glacialis* (Grinnell). VALDEZ DOWNY WOODPECKER. [394 f.] *Dryobates pubescens glacialis* Grinnell, Univ. California Publ.

- Zool., vol. 5, March 5, 1910, p. 390, fig. 7. (Valdez Narrows, Prince William Sound, Alaska.) Additional subspecies. Kenai Peninsula to Taku River, Alaska. See Peters, Check-list Birds World, vol. 6, 1948, pp. 209-210.
201. Subfamily *Jynginae*. WRYNECKS.
Genus *Jynx* Linnaeus.
Jynx Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 112. Type, by monotypy, *Jynx torquilla* Linnaeus.
Jynx torquilla chinensis Hesse. CHINESE WRYNECK. [415.] *Jynx torquilla chinensis* Hesse, Orn. Monatsb., vol. 19, no. 11, November, 1911, p. 181. (Tsingtao, China.) Additional form (which adds a subfamily and a genus to the list as indicated above). Manchuria and Sakhalin to Kashmir and central China, in migration to Siam and Indo-China. Accidental at Wales, Alaska, September 8, 1945. See Bailey, Birds Arctic Alaska, Colorado Mus. Nat. Hist., Pop. Ser. no. 8, 1948, p. 270, where the bird is listed as *Jynx torquilla harterti*, which Wetmore and Friedmann find is a synonym of *chinensis*. See Condor, vol. 51, 1949, p. 103.
220. *Perisoreus canadensis sanfordi* Oberholser. NEWFOUNDLAND GRAY JAY. [484 h.] *Perisoreus canadensis sanfordi*. Oberholser, Proc. Biol. Soc. Washington, vol. 27, March 20, 1914, p. 49. (Fox Island River, Newfoundland.) Additional subspecies. Newfoundland and Nova Scotia. See Burleigh and Peters, Proc. Biol. Soc. Washington, vol. 61, 1948, p. 114.
232. *Parus hudsonicus rabbittsi* Burleigh and Peters. NEWFOUNDLAND BROWN-CAPPED CHICKADEE. [740 d.] *Para* (sic) *hudsonicus rabbittsi* Burleigh and Peters, Proc. Biol. Soc. Washington, vol. 61, June 16, 1948, p. 115. (St. Andrews, Newfoundland.) Additional subspecies. Newfoundland.
250. *Catherpes mexicanus punctulatus* Ridgway, *C. m. griseus* Aldrich, and *C. a. polioptilus* Oberholser become synonyms of *Catherpes mexicanus conspersus* Ridgway, individual variation being such that the supposed separate forms may not be recognized. See Miller, Condor, vol. 50, 1948, pp. 83-85.
255. *Turdus musicus musicus* Linnaeus. EURASIAN RED-WINGED THRUSH. [760 a.] *Turdus musicus* Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 169. (Europe = Sweden.) Additional subspecies. Europe and central Siberia, south to the Mediterranean and Iran; casual at Scoresby Sound, eastern Greenland, October 6, 1934. See Hørring and Salomonsen, Medd. om Grønland, Bd. 131, no. 5, 1941, p. 83.
259. *Hylocichla guttata crymophila* Burleigh and Peters. NEWFOUNDLAND HERMIT THRUSH. [759 g.] *Hylocichla guttata crymophila* Burleigh and Peters, Proc. Biol. Soc. Washington, vol. 61, June 16, 1948, p. 117. (Badger, Newfoundland.) Additional subspecies. Breeds in Newfoundland; range in migration and in winter at present not known.
271. *Phainopepla nitens nitens* (Swainson). SOUTHERN PHAINOPEPLA. [620 a.] *Phlogonys nitens* Swainson, Animals in Menageries, 1838 (1837), p. 285. (México.) Additional subspecies. Brewster County, Texas, south to Veracruz. See Van Tyne and Sutton, Univ. Michigan Mus. Zool., Misc. Publ. no. 37, 1937, p. 78.
285. *Peucedramus olivaceus arizonae* Miller and Griscom becomes *Peucedramus taeniatus arizonae*, as the specific name, based on *Sylvia olivacea* Giraud, published in 1841, is preoccupied by *Sylvia olivacea* Vieillot of 1817. The next available name is *Sylvia taeniata* Du Bus, Bull. Acad. Roy. Sci. Lettr.

- Belgique, vol. 14, pt. 2, 1847, p. 104. (México). See Zimmer, Auk, vol. 65, 1948, pp. 126-127.
294. *Seiurus noveboracensis linnaeus* McCabe and Miller. BRITISH COLUMBIA WATER-THRUSH. [675 b.] *Seiurus noveboracensis linnaeus* McCabe and A. H. Miller, Condor, vol. 35, no. 5, September 15, 1933, p. 196. (Indian-point Lake, Cariboo District, British Columbia.) Additional subspecies. Breeds in British Columbia, in migration to Panamá. See Grinnell and Miller, Pac. Coast Avif. no. 27, 1944, p. 409.
298. *Cardellina rubrifrons rubrifrons* again becomes *Cardellina rubrifrons* (Giraud) as the supposed Guatemalan race *bella* proves invalid. See Wetmore, Proc. U. S. Nat. Mus., vol. 89, 1941, p. 570; van Rossem, Occ. Papers Mus. Zool. Louisiana State Univ., no. 21, 1945, p. 232.
300. *Setophaga ruticilla* becomes *Setophaga ruticilla ruticilla* through addition of the following subspecies.
300. *Setophaga ruticilla tricolora* (Müller). NORTHERN REDSTART. [687 a.] *Molacilla tricolora* Müller, Vollst. Natur.-Syst. Suppl. Reg. Band, 1776, p. 175. (Cayenne.) Additional subspecies. Breeds from Mackenzie and Washington through central Ontario and Quebec to northern Maine and Newfoundland; in migration to northern South America. See Burleigh and Peters, Proc. Biol. Soc. Washington, vol. 61, June 16, 1948, p. 121.
306. *Icterus cucullatus californicus* (Lesson), added in the Nineteenth Supplement, Auk, vol. 61, July, 1944, pp. 459-460, is numbered 505 c.
306. *Icterus cucullatus cucullatus* Swainson. SWAINSON'S HOODED ORIOLE. [505 d.] *Icterus cucullatus* Swainson, Phil. Mag., n. s. vol. 1, no. 6, June, 1827, p. 436. (Temascáltepec, Estado de México.) Additional subspecies. Nuevo León south to Jalisco and Colima; taken near Marathon and Del Rio, Texas. See Van Tyne and Sutton, Univ. Michigan Mus. Zool., Misc. Publ. no. 37, 1937, p. 92; Burleigh and Lowery, Auk, vol. 58, 1941, p. 101.
320. *Carpodacus purpureus nesophilus* Burleigh and Peters. NEWFOUNDLAND PURPLE FINCH. [517 b.] *Carpodacus purpureus nesophilus* Burleigh and Peters, Proc. Biol. Soc. Washington, vol. 61, June 16, 1948, p. 122. (Stephenville Crossing, Newfoundland.) Additional subspecies. Breeds in Newfoundland; range in migration and in winter at present not known.
333. *Pipilo aberti* Baird becomes *Pipilo aberti aberti* through recognition of a western race. See Twenty-second Supplement, Auk, vol. 64, 1947, p. 451.
336. *Passerculus sandwichensis halophilus* (McGregor) becomes a synonym of *Passerculus sandwichensis guttatus* Lawrence, which takes the common name Abreojos Savannah Sparrow, since the term San Lucas Savannah Sparrow used formerly is misleading, the bird being only casual in occurrence at Cape San Lucas. See van Rossem, Condor, vol. 49, 1947, pp. 101-102.
359. *Melospiza melodia gouldii* Baird. MARIN SONG SPARROW. [581 aa.] *Melospiza gouldii* Baird, Pac. R. R. Rep., vol. 9, 1858, p. 479. (California = 5 miles west of Inverness, toward Point Reyes.) Additional subspecies. Coastal and interior areas in central western California, from San Francisco Bay area (exclusive of salt marshes) to Sonoma, Mendocino, Colusa, Yolo and Contra Costa counties. For detailed range see Marshall, Condor, vol. 50, 1948, p. 255; see also Grinnell and Miller, Pac. Coast Avif. no. 27, 1944, pp. 547-548.

359. *Melospiza melodia inexpectata* Riley. YELLOWHEAD SONG SPARROW. [581
bb.] *Melospiza melodia inexpectata* Riley, Proc. Biol. Soc. Washington,
vol. 24, November 28, 1911, p. 234. (3 miles east of Moose Lake, British
Columbia.) Additional subspecies. British Columbia, breeding in the
northern and central sections; in winter to the southern coast. See Munro
and Cowan, Brit. Col. Prov. Mus., Spec. Publ. no. 2, Dec., 1947, pp. 234-
235, 236.

GENERAL NOTES

Dexterous alighting maneuver of passenger pigeons.—I saw *Ectopistes migratorius* only once in my life, but I had an excellent view of the flock, and it made a deep and lasting impression. I was 13 years old. My diary of field-sports tells that on September 1, 1888, I was gunning for doves, *Zenaidura macroura*, near York, Pennsylvania. Suddenly there came into sight a flock of 150 to 175 wild pigeons. I had long been watching and hoping for them, and I tried unsuccessfully to stalk them.

What impressed me indelibly, and I have made a mental note of it ever since, was the compactness of their flock formation, their great rapidity of flight, and their alighting maneuver as they sped into a large white oak, standing alone in the corner of a grass-field, about 350 yards from me. Flying toward the tree, slightly above its crest, the compact flock suddenly dropped almost straight down, converged funnel-like nearly against the ground, and then rose sharply, almost against the tree-trunk, spreading into the branches above them.

I have never noted this collective pattern of alighting in any other species of birds. I believe this alighting maneuver was distinctive of the passenger pigeon.—HERBERT H. BECK, *Franklin and Marshall College Museum, Lancaster, Pennsylvania.*

Hummingbird killed by preying mantis.—Late in the afternoon of September 17, 1948, I saw a mantis poised on an orange-colored zinnia. When a hummingbird, *Archilochus colubris*, flew to the flower, the mantis seized the bird. I hastened to rescue the bird, but even after both had been removed to the ground the mantis would not release its hold. As the two were forcibly separated, bits of feathers held by the mantis were torn from the bird. The only blood to appear was from the bill of the bird.—CHRISTELLA BUTLER, *Grant Ave. and Ashton Road, Philadelphia, Pennsylvania.*

Hummingbird captured by preying mantis.—In September, 1948, my neighbor, Mrs. O. K. Smith, heard a shrill bird-call early one evening. Presently she saw several hummingbirds, *Archilochus colubris*, circling around a blossom. The calls came from one bird that was being held in the grasp of a mantis poised on a flower. Mrs. Smith took the struggling bird into her hands, and it collapsed. She watched long enough to see it revive and fly away. There was a spot on its head where it was bleeding.—EARL M. HILDEBRAND, *Agricultural and Mechanical College of Texas, College Station, Texas.*

Scissor-tailed flycatcher in southern Louisiana in winter.—While traveling "Little Caillou Route," along Bayou Petit Caillou between Houma and Chauvin (Terrebonne Parish) in extreme southern Louisiana, Mr. Horace Whitten, biologist of Waubun Laboratories, Schriever, Louisiana, saw a pair of scissor-tailed flycatchers, *Muscivora forficata*, on December 2, 1947. The birds were near the highway and adjoining the Houma Naval Airport and when not in flight alighted on telephone wires and a nearby fence. He reported the observation to me and subsequently saw the birds several times between December 10 and 27. On January 4, 1948, we saw three of the birds at one time. The long, deeply forked tail, though somewhat abbreviated in two of the birds, was that of an adult in the other bird. These flycatchers were seen to very good advantage as they cavorted in the air, and it is my belief that they were a family group.

Oberholser's "The Bird Life of Louisiana" (1938) lists the scissor-tailed flycatcher as "a rare spring and fall transient, from March 25 to April 10, and from October 4 to

October 6, in southern Louisiana." Oberholser's latest autumn date in Louisiana is October 6, 1889, and there are no winter records. I have been unable to find any other record of winter occurrences in the state. Howell and Green, in their works on Florida birds, report the species as not uncommon in winter in southern Florida; Bent (U. S. Nat. Mus. Bull. 179: 91, 1942) likewise reports winter records from southern Florida; Greene *et al.*, in their work on the birds of Georgia, have a single record of a wintering bird—at Tifton, southern Georgia, January 2 to February 9, 1943; Burleigh does not record the species in his study of the birds of southernmost Mississippi; Williams, Rice Institute, Houston, Texas, tells me that he knows of only two winter records of the species on the Texas coast in the last 15 years—at Galveston on December 14 and December 25, 1941, and at Rockport on December 6, 1942; and the species has appeared but once (1939) on the Christmas bird-counts recorded from the lower Rio Grande Valley since 1933. In view of the extreme scarcity of the species in winter along most of our gulf coastal area, the three birds wintering in southern Louisiana seem worth recording.—JOSEPH D. BIGGS, *Waubun Laboratories, Schriever, Louisiana.*

Muscivora forficata in Florida.—In the Auk (65: 143, 1948) I saw a record for the scissor-tailed flycatcher, *Muscivora forficata*, in south Florida. It should be pointed out that this species is by no means rare at Key West. There are numerous records for that area. I saw at least three there on March 9, 1946, and even obtained kodachrome motion pictures of one. On April 4, 1942, I saw one near Homestead; on April 13, 1946, I observed another as far north as Cross City and on March 2, 1948, found one at Fort Meyers.—ALLAN D. CRUICKSHANK, *Rye, New York.*

Crested flycatchers nesting some distance from their foraging area.—Shackleford Banks is a narrow island on the North Carolina coast, just westward of Cape Lookout. The outer half of the island is a desolate stretch of barren sand, on which are scattered about the broken skeletons of a dead forest of red cedars killed by wind-driven sand. The inner half of the island is covered by a dense woodland formed chiefly of red cedar, live-oak, and yaupon holly. The inner margin of the sand forms a wall which is slowly advancing over the island and burying the woodland along an irregular line which now lies 400 to 800 yards from the outer beach.

In June, 1948, two nests of the crested flycatcher, *Myiarchus crinitus*, were found far out in the dead forest. The first (June 10) was in a weathered-out knothole in a nearly horizontal branch of a red cedar, about two feet above the sand. This tree stood 167 long paces, in a direct line, from the woodland at the edge of the sand wall, and 114 paces from the beach. Two birds were bringing food to the nest which contained at least three young. A second nest was discovered (June 11) in a similar location, about 1200 yards distant. This one was 274 long paces from the woods, only 97 paces from the beach. It was within sight and sound of the surf, in one of the outermost of the dead trees. Here also, two birds were busy feeding the five young.

In short observation periods on three separate days I saw these birds make ten round trips between the nest sites and the woodland carrying food to the young. Insects were not entirely lacking on the sandy waste since many large dragonflies hawked over it, but the strong onshore wind which always blows here in the summer kept the area decidedly clear of the mosquitoes, gnats, and several kinds of biting flies which are numerous in the woodland. Once, one of the parents, perching as usual for a moment on the nest-tree after a trip to the nest with food, darted out to catch a dragonfly within five feet of the nest and carried it inside. This was the only observation of the birds taking food over the sand waste. They habitually flew

several hundred yards to the woodland on a circuitous route, making a noticeably slow and labored return against the strong wind. It seemed that the flycatchers sought all their food in the distant woodland. They never were seen perched anywhere in the dead forest, except close by or on the nest-tree, immediately before entering the nest or immediately after leaving it.

Since there are many decaying or partly decayed live-oaks in the woodland offering apparently suitable nesting sites, and since the skeletons of the sand-killed trees come right up to the sand wall at the edge of the woodland, it is puzzling that these birds should go so far out into the wasteland, so far from their foraging area, to establish their nests. In flying between the edge of the woodland and the nest sites, the birds passed dozens of dead trees, every one of which contained cavities that appeared (to the human eye) to be identical with those chosen by the birds. I am certain that none of these was being used by other birds, so that competition could not have been a factor in selecting the sites. This open wasteland, dotted with dead trees, is entirely free of snakes and other predators, so that the nests, because of their location, were completely insured against predatory enemies; but is it reasonable to suppose that the flycatchers could realize that fact, and act accordingly? The nests would also have been immune from attack in dead trees near the sand wall adjacent to the foraging area; in other years, I have found crested flycatchers nesting here, within 20 yards of the woodland.—WILLIAM L. ENGELS, *Department of Zoology, University of North Carolina, Chapel Hill, N. C.*

Probable destruction of queen bees by swallows.—Mr. Fred M. Sickler of Bonsall, California, noted my article (*Condor*, 47: 261-264, 1945) on swallows selecting drone bees. He is of the opinion that birds cause a very negligible loss of worker bees, that the loss of drones is a good riddance, and that swallows do real harm in eating queen bees.

Mr. Sickler writes: "This summer I noticed large numbers of barn, cliff and green-back swallows flying about 100 feet above one of my apiaries for several weeks. Fifteen parent hives became queenless after swarming, a real loss in more ways than one. Worker bees fly close to the ground whereas queens and drones fly high and slow. There was no loss of queens at another apiary three miles away where no swallows had appeared."

To the list of bee-eating birds which appeared in the above quoted article, Mr. Sickler adds the California shrike, *Lanius ludovicianus gambeli*, and Brewer's black-bird, *Euphagus cyanocephalus*. I saw a California brown towhee, *Pipilo fuscus*, apparently pick up and eat a bee from the alighting board of my hive, but as I have seen this only once I cannot be sure of the case.—CHAPMAN GRANT, 2970 Sixth Ave., San Diego, California.

Fall aggregations of cliff swallows in the Allegheny Mountains.—For the past 20 years I have been observing aggregations of northern cliff swallows, *Petrochelidon pyrrhonota*, in fall migration through West Virginia and Maryland sections of the Alleghenies. These aggregations are usually to be found during the last week of August and the first 10 days of September. They almost invariably occur in elevated valleys between the high Allegheny ridges. I have not found large flocks of migrating cliff swallows in autumn in any lowland section of the region.

One of the remarkable features of these aggregations is that the birds return to the same sections of telephone and power line wire each season. Mr. Brown Beard of Bartow, West Virginia, a careful observer, tells me that in 30 years the swallows have not failed to appear along a certain section of State Highway No. 28, near his

home. During seven recent seasons I have found them in this locality in numbers between 2000 and 3000 annually.

Other places where the swallows occur regularly in late August and early September are: near Oakland, Garrett County, Maryland; near Daily, Randolph County, West Virginia; at Red Creek, Randolph County, West Virginia; and near Greenbank and Marlinton, Pocahontas County, West Virginia. Despite the fact that there are hundreds of miles of telephone and power lines through this region, the cliff swallows are to be found in almost exactly the same locations year after year.

Sections of wire selected for these migration roosts are usually along public highways. There are always broad mountain meadows near by, and usually there is a stream in the vicinity. Flocks number between 2000 and 5000 birds, many actual counts having been made.

In eight such aggregations examined carefully in the autumns of 1947 and 1948, I was unable to find a single individual of any other species of swallow. Gross, in one of the Bent bulletins (U. S. Nat. Mus. Bull. 179: 466, 1942) states, "The Cliff Swallow migrates in flocks, and practically all the reports of the large numbers seen throughout the migration route mention the association of the Cliff Swallow with Barn and Tree Swallows as well as other members of the family." Mixed flocks are certainly the rule during spring migration in West Virginia and western Maryland, but they seldom occur in autumn.

On the evening of September 3, 1947, I saw a striking variation in roosting behavior of cliff swallows. The large aggregation which appears annually near Bartow, West Virginia, usually roosts on wires on either side of the highway. On this evening, however, all members of the flock forsook the wires and settled to roost in a near by cornfield. The birds used both tassels and the axes of corn leaves as roosting perches.

That cliff swallows which occur in autumn in the Allegheny region may assemble from a vast breeding area is evidenced by a single banding record. Gross (*op. cit.*) tells of a bird of this species banded on June 14, 1937, at Dell Rapids, South Dakota, and recovered on July 16, 1937, at Ghent, West Virginia, a distance of some 1200 miles.—MAURICE BROOKS, *West Virginia University, Morgantown, W. Va.*

January singing in the black-capped chickadee and other species.—

Francis H. Allen's observations on the January singing in the black-capped chickadee, *Parus atricapillus*, in *The Auk* (64: 616, 1947) coincide with my own, and it is upon his suggestion that these notes have been written. I wish to point out, however, that my records only date back to the winter of 1944-45. My observations are based mainly on a special study during January, 1948, after my interest was aroused by Saunders' article 'Beginning of song in the spring' (*Auk*, 64: 97, 1947) and Allen's comments thereupon in the October, 1947, issue of *The Auk*.

At our home, which is located in the woods halfway between North Bay and Mattawa in central Ontario, some black-capped chickadees are resident all year, as shown by banding. During January, 1945 and 1946, my records note January singing, and in 1947, the first "phoebe"-song was noted on January 7. About 20 black-capped chickadees were regular visitors at my feeding station during January, 1948. No observations were made on January 10 and 24. During the remaining 29 days the blackcaps were heard singing every day except January 2, 3, 15, 18 and 19. The time preferred for singing was apparently just before sunup when one or several birds would begin to sing; sometimes they continued singing for 10 to 15 minutes. At this time they could often be heard from all parts of the

woods, as they emerged in the morning twilight from sheltered places where the evergreens stood thick and the birds apparently had their nightly roosts. Apart from the singing before sunup, birds were also heard later in the day on nine occasions: six times during the forenoon and three times during the afternoon; once, on January 29, as late as 4:42 p. m. or just before sunset. On January 1, two black-capped chickadees sat on song perches and gave three minutes of competitive singing. On January 2, the first chasing was observed; chasing was also observed three or four times later in the month.

In connection with weather conditions, I took the following notes. During four of the five non-singing days, the temperature was below zero Fahrenheit, once reaching 43 degrees below zero. On two days, the weather was clear, on two overcast and on one snowing. On 13 of the 24 days during which the birds were heard singing, the temperature at the time of song was below zero. On January 31, one bird was heard singing twice at 43 degrees below zero. The birds sang on eight days when the weather was clear and cold, on nine days when it was overcast and milder, and on seven days during moderate to heavy snow. From this, it may be concluded that weather conditions had little influence on their singing, especially towards the end of the month.

Of other birds heard singing during January, 1948, I may mention the purple finch, *Carpodacus purpureus*. It is the first time I have observed this species wintering in this region. On January 5, a mild and sunshiny day, I saw an immature male sitting in the top of a tree, giving the "vireo song" (Saunders, 'A guide to bird songs,' 1935: 246) continuously for about 10 minutes. Again on January 21, a mild and overcast day, and on January 29, a clear day with below zero temperature, I heard this finch sing the same song. Mr. Saunders gave as his first date of the "common song," January 30, 1926 (Auk, 64: 103, 1947), while the earliest record I have of this song is February 20, 1948. On January 20, I heard the Red crossbill, *Loxia curvirostra*, singing; the white-winged crossbill, *Loxia leucoptera*, sang on January 2, 9 and 13; and the pine siskin, *Spinus pinus*, was heard singing on January 29, 30 and 31. With regard to the two last species, it may be of interest to mention that the pine siskins were seen chasing before they were first heard singing, and a white-winged crossbill was observed in a magnificent flight display on January 2. In the red crossbill, courtship feeding was observed on February 3.

In 1946, four brown-headed chickadees, *Parus hudsonicus*, spent part of the winter in this area, and I had the opportunity several times of hearing their song which I believe to be the counterpart of the blackcap's "phoebe" song. The birds, according to my notes, began singing on January 29, but it was not until March 13 that I realized the significance of the song and made comparative notes on the singing of the two species. I described the song as a half whistled, half warbled "eet-tulu" with variations of "eet-tulululu" or "eepit-tulululu," given at about the same pitch as the blackcap's song. The accent was always on the first or second note with the ending trill, quite musical and of a liquid quality, uttered rather like an afterthought. Like the blackcap, the brown-headed chickadee generally took up position on a singing perch and would give song after song.

I acknowledge gratefully the kindness of Dr. J. M. Speirs who edited these notes.—
LOUISE DE KIRILINE LAWRENCE, Rutherglen, Ontario, Canada.

Courtship feeding by the Carolina chickadee and tufted titmouse.—Neither Lack's review of courtship feeding in birds (Auk, 57: 169-178, 1940) nor Bent's volume on the Paridae (U. S. Nat. Mus. Bull. 191, 1946) records courtship

feeding in the Carolina chickadee, *Parus carolinensis*, or the tufted titmouse, *Parus bicolor*. Laskey (Auk, 58: 57, 1941) reported it in the Carolina chickadee in April, but the stage of the breeding cycle was unknown. She also described an incident suggesting courtship feeding in a tufted titmouse before nesting had started. Odum (Auk, 59: 430, 1942) mentions that at a nest of Carolina chickadees the male accompanied and fed the female during the inattentive periods of incubation.

TUFTED TITMOUSE. On April 18, 1948, I color-banded in quick succession two titmice on my feeding shelf; neither had a brood patch. On April 25, one of these birds fed the other, twice within a minute or two, in a tree near my home. Little calls were given continuously by, I thought, the one thus shown to be the female, during some minutes that the birds spent in the tree; the female quivered her wings during the male's approaches with food. The female also appeared to be foraging for herself. As just a week earlier she did not show a brood patch, laying may not yet have begun. On June 26, these birds were caring for flying young.

CAROLINA CHICKADEE. In Dickeyville, a suburb of Baltimore, in 1948, I saw the male of a color-banded pair of chickadees feed the female on April 18, while she was building in a nest-box; this box was not the one finally used. In 1947, I had seen courtship feeding by this pair of birds, both at the nest and away from it, from May 4 when incubation appeared to be under way, until May 17 when both parents were feeding young in the box. The female also foraged for herself during her inattentive periods throughout this time. The following notes are on the nesting in 1947.

Nesting stages. Because the nest-box these birds used could not be opened it was impossible to follow the nesting with precision, and I made observations only on scattered days. The male was feeding the female* off the nest on May 4, when incubation apparently was under way. On May 10 to 13, definite incubation days, he fed her repeatedly, both on and off the nest. On May 17, when both parents were feeding young and the female was also brooding for long periods, the male at least once fed the female off the nest; he also repeatedly gave food to her on the nest, but whether she ate any of this or passed it all on to the young could not be determined. On May 21 and later dates, there was no indication of feedings off the nest; the ultimate recipient of food the male gave to the brooding female remained undeterminable.

On-the-nest feedings. When the female was fed on the nest, the male would cling at the hole, and the female came up to it. This occurred in 10 of 15 complete sittings by the female; these 10 periods ranged in length from five to 51 minutes. On four other occasions she ended sittings of eight to 16 minutes by leaving the nest-box to receive the food on the male's arrival. One sitting of nine minutes was the only one I saw during which, or as a conclusion to which, she was not fed.

There was no regularity about the male's visits to the box with food. For example, during one sitting of 41 minutes the female was fed three times; during another sitting of 43 minutes she was fed only once. The male appeared with food as soon as one-fourth minute after the female began a sitting, and as tardily as 24 minutes after.

Once, on May 12, during an 18-minute inattentive period by the female the male went to the nest-box with food while she was still away. After looking into the box, he moved to a perch for a few seconds with the food, then flew away; whether he himself ate his offering at the last moment I could not see. This 18-minute period of inattentiveness on the part of the female was the longest seen in 500 minutes of observation of incubation; the average length was 6.1 minutes.

Off-the-nest feedings. Of the 17 complete inattentive periods that I watched

during incubation, the female spent 14 away from the tree that held the nest-box. During eight of these I could not tell whether the male made feedings. During six he did, and at least sometimes he made repeated ones; I saw two during a five-minute inattentive period, and three during a six-minute period. There may well have been more each time. In addition, the female foraged for herself.

On the other three occasions, upon the male's arrival with food, the sitting female left the box simply to be fed and after one-fourth, one-half, and one and three-fourths minutes returned to the eggs without having been fed again or doing any foraging herself. These three occurrences were successive ones on the afternoon of May 13, when I thought hatching was near; except for these brief respites, the female made a sitting of 71 minutes.

Female's behavior when fed. When the female was fed on the nest I noticed no calls or begging display, although I regularly watched from a distance of only 20 feet. Off the nest, the female begged for food by quivering her wings and giving calls 'dee, dee, dee; swee-dee-dee; chick-a-dee-dee-dee' while her mate was foraging near by, even when he seemed to be out of her sight, and while he was approaching and delivering the food.—HERVEY BRACKBILL, 4608 Springdale Avenue, Baltimore, Maryland.

House wrens feeding a cowbird.—On July 12, 1947, while on a field trip along Duck Creek, Scott County, Iowa, I came upon an immature cowbird, *Molothrus ater*, perched on a low limb of a tree. The cowbird gave low calls. I concealed myself to wait and see who the foster parents were. A few seconds later a western house wren, *Troglodytes aedon*, flew to the fledgling cowbird and fed it. The wren was soon joined by its mate which also fed the cowbird. My presence was detected by the wrens and they gave the usual alarm and scolding calls, but the cowbird gave no heed to the excited house wrens and kept calling for more food. The wrens flew to some underbrush 50 feet away, and the cowbird immediately followed them. While watching this trio through field glasses, the cowbird was fed several more times.

This is the first time I have found the house wren to be a molothrine victim. Frances Hamerstrom reported (Wilson Bull., 59: 114, 1947) a similar affair, but his wrens were nesting in boxes while the wrens that I observed were nesting, so I believe, in the wild state. The wrens use deserted woodpecker holes and natural cavities as nesting sites, making it much more difficult for a cowbird to deposit eggs in their nests.—JAMES HODGES, 3132 Fair Avenue, Davenport, Iowa.

Catbird's defense behaviorism.—We have hanging on one side of our yard a suet "stick" for the birds. Among other species the blue jay and the catbird, *Dumetella carolinensis*, are fond of the suet. After the blue jays brought forth their young, they became very possessive of the "stick" and drove away any other birds caught feeding there. When the catbird was so attacked, it squalled like a lusty, young bird and launched forth from the tree like a fledgling with half-open, feebly-fluttering wings—sinking rapidly until it nearly touched the ground and then rising up until it gained the branch of an apple tree on the other side of the yard. There it paused briefly, shook itself, looked around alertly, and flew off in normal fashion toward its nesting area. The psychology of the action reminds me of the way a puppy will roll over on its back when approached by a strange dog, submitting as its sole defense the fact that it is just a puppy.

This catbird went through this performance many times this summer. It would be interesting to learn if this is normal behavior for all catbirds or just the particular reaction developed by this individual.—F. J. FREEMAN, Itasca, Illinois.

Recent emigrations of northern shrikes.—The northern shrike, *Lanius excubitor*, is one of the northern predators which depends upon mice and hence fluctuates greatly in abundance due to the cyclic changes in food supply. The shrikes emigrate from Canada in large numbers and have appeared in northern United States about every four years (Davis, Auk, 54: 43-49, 1937).

The present paper discusses the abundance of shrikes from 1930 to 1948, thus bringing the reports up to date. As in the previous paper, the Christmas censuses from Bird-Lore (now Audubon Magazine) were used for an area bounded by: Quebec, Ontario, Minnesota, Iowa, Missouri, Illinois, Indiana, Ohio, and Maryland. The work was conducted under a grant from the International Health Division of the Rockefeller Foundation.

Figure 1 shows the number of shrikes and crows seen per census, with the years from 1930 to 1935 redrawn from the previous paper. The crows are used as a reference to indicate the changes in abundance of a non-cyclic species.

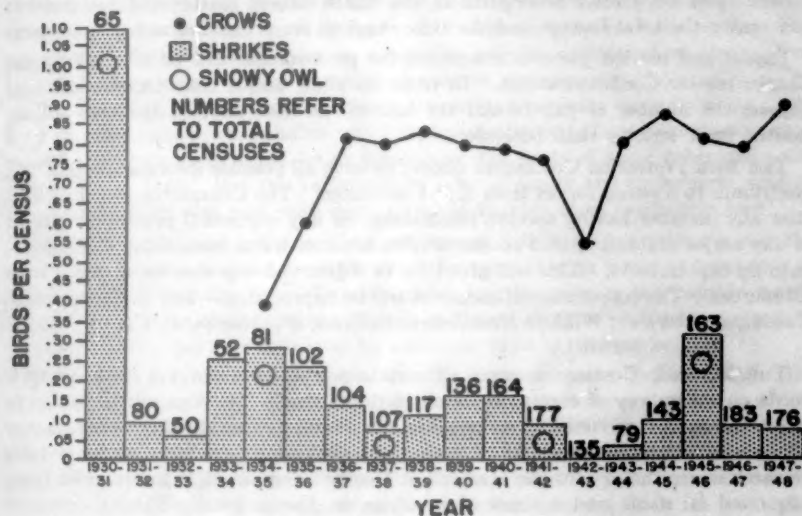


FIGURE 1.—Numbers of shrikes and crows seen in Christmas censuses. O indicates an invasion of snowy owls into New England.

It is at once apparent that the shrikes change in abundance, but that recently the changes have occurred at intervals of four, five and six years. Furthermore, only two of these peaks coincide with the invasions of snowy owls, *Nyctea scandiaca*, (Gross, Auk, 64: 584-601, 1947). Note that few shrikes were seen in 1937-38 when there was a minor invasion of owls and that a number of shrikes invaded northern United States from 1939 to 1941, before the invasion of owls in 1941-42. An analysis of the geographical distribution of shrikes in the northern states suffers from lack of sufficient numbers but suggests that in 1939-40 and 1941-42 the birds invaded New England, while in 1940-41 the shrikes were relatively more common in the north central states.

To conclude, these dates indicate that emigrations of northern shrikes have recently occurred at intervals of five or six years and are not synchronous with invasions of snowy owls.—DAVID E. DAVIS, Department of Parasitology, Johns Hopkins University, Baltimore, Maryland.

NOTES AND NEWS

THE Sixty-seventh Stated Meeting of the American Ornithologists' Union will be held October 10 to 14, 1949, at Buffalo, New York. Hosts for the meeting will be the Buffalo Ornithological Society and the Buffalo Society of Natural Sciences. Public sessions will be held October 11 to 13, 1949, at the Buffalo Museum of Science. Headquarters will be at the Hotel Statler where the banquet will be held on Wednesday evening, October 12. Mr. James Savage, Buffalo Athletic Club, Buffalo, New York, is chairman of the Local Committee on Arrangements.

Titles of papers and motion pictures for presentation at the meeting must be in the hands of the Secretary, Dr. Olin Sewall Pettingill, Jr., not later than September 1. The title of each paper should be accompanied by a brief abstract of the paper's contents and a statement concerning the time desired for delivery and the kind of projection facilities needed, if any. The title of each motion picture should be accompanied by a brief description of the film's subject matter and a statement concerning the total footage and the time required for projection and commentary.

Papers and motion pictures submitted for presentation will be selected by the Committee on Communications. In order to allow ample time for discussion of papers, the number of papers and the amount of time allotted speakers will be limited more strictly than heretofore.

THE Bird Protection Committee desires to have all possible information that will contribute to a sound report from that Committee. The Committee therefore asks that any member having specific information on any successful protection project or any major problem of bird protection forward it to me or some other Committeeman by September 1. This will give time to digest and organize the material from all sources. The cooperation of members will be appreciated.—IRA N. GABRIELSON, *Committee Chairman, Wildlife Management Institute, Washington, D. C.*

THE Research Committee urges all members who have not yet returned their cards on the survey of current research to do so soon. The Committee wishes to make the survey as complete as possible and would appreciate the cooperation of all members in notifying others of the survey, particularly graduate students doing research in ornithology for the Master's or Doctor's degree. The information being requested is: name and address of investigator, institutional affiliation, research project, and degree sought, if any. Additional cards are available on request.—ALBERT WOLFSON, *Committee Chairman, Dept. Biol. Sci., Northwestern Univ., Evanston, Illinois.*

The Committee on Education reports that the following persons have been awarded honorary affiliation with the Union for 1949.

LYTLE HOUSTON BLANKENSHIP, Box 5557, College Station, Texas.
JOHN LOTHAR GEORGE, Dept. Zool., Univ. Mich., Ann Arbor, Mich.
MERIBETH JEANNE MITCHELL, 2633 Chicago Ave., Minn., Minnesota.
ROBERT WILLIAM NERO, 932 Williamson, Madison 5, Wis.
ALBERT NELSON ROBINSON, Jr., P. O. Box 7009, Univ. Sta., Baton Rouge, La.
LUTHER HARRELL ROGERS, P. O. Box 385, Appleton, Wis.
ROBERT KEITH SELANDER, 3666 W. 2nd North, Salt Lake City 3, Utah.
WILLIAM JOHN SMITH, 428 Sunnyside Ave., Ottawa, Canada.
ROBERT WILLIAM TURNER, 10228-131 A St., Edmonton, Canada.
WILLIAM LEWIS WYLIE, 1310 National Road, Wheeling, West Va.

RECENT LITERATURE

Ecologic races of song sparrows in the San Francisco Bay region.—Part I, Habitat and abundance. Part II, Geographical variation. MARSHALL, JOE T. Condor, 50: 193–215, 233–256, 9 figs., 3 tables, 1948.—The San Francisco Bay region in west central California is only about 60 miles long, and little more than half as wide. Yet in this small space four subspecies of song sparrows, *Melospiza melodia*, occur as residents, three of them restricted to small ranges within this area, and the fourth more widespread. Of the three endemic subspecies, *M. m. pusillula* occupies the salt marshes of the south arm of the bay; *samuelis* occupies the salt marshes of the north arm of the bay; and *maxillaris* occupies the brackish marshes of a northeast extension of the north arm of the bay. The fourth and more widespread subspecies *gouldii* occupies the riparian, fresh water marsh, and chaparral habitats of the uplands surrounding the bay and west to the sea coast.

These races have been quoted as an example of the effect of ecology in producing subspecies and considered as ecological rather than geographical subspecies. The status of the various populations as subspecies may be questioned on the basis of lack of a range of any extent in which characters are constant, "no race possesses stable characters over a fixed area" "they are nothing but color races definable solely because they contain a population which is the culmination of some color gradient—entirely different races could be designated on the basis of some other character gradient" (p. 254). But the variations in color of upper and underparts, and in measurements are real, and, with names, populations are more easily discussed.

Song sparrow habitat and song sparrows are not distributed continuously over the area. The bayside marshes are interrupted by areas of open water or by ranges of hills projecting into the bay. Bayside plains largely separate the bayside marsh habitats from those of the uplands, though in almost all cases each area of marsh is connected with some upland habitat by a tenuous band of riparian habitat.

There seems to be some confusion as to what is meant by the "isolation" effective in producing subspecies. Many very different subspecies have developed within species with continuous ranges. Not infrequently the variation correlates with a difference in habitat, and there is usually a broader or narrower band of intergradation. The two subspecies are "isolated" in space, except for their zone of contact. Each subspecies may be developed with characters adapting it to its particular habitat, and to that extent it is an ecological subspecies. However, the bulk of each population is isolated in space, though there are no gaps in the range, no barriers or "geographical isolation." The concept of ecological subspecies, which has never been demonstrated for birds, is that a preference for one or another type of habitat may enable two subspecies of one species to occur throughout an area, "isolated" by habitat preferences, but without either spatial isolation or geographical barriers.

In the present case, though the characters of the various races are said to be not obviously adaptive, they are definitely correlated with ecology. And further, the various habitats replace each other geographically! The unusual feature is that this speciation has all occurred in such a small area.

From the detailed presentation on habitats and variation, it appears that several factors have been important: (1) the sedentary nature of the populations and the little wandering of individuals; (2) the relatively large blocks of marsh habitat at three separate places on the bay; (3) the dense population of song sparrows supported by these marsh habitats, compared with the more sparsely populated upland areas;

(4) the selective pressure of the marsh habitat; and (5) the isolation (gaps in distribution, that is, uninhabitable habitat) of various habitats, or parts of them.

Marshall perhaps tends to overemphasize the isolation factor to make his point, which is true, that these are not ecological races but geographical races. The importance of geographical isolation is shown by *samuelis* and *pusillula* each occupying salt marsh habitat, apparently alike, at opposite ends of the bay area, with gaps in the marsh habitat between. It is also shown by the lack of intergradation between bayside and upland populations, except along the narrow connecting corridors and in the few cases where a small salt marsh habitat adjoined an area of upland habitat and the population of the salt marsh habitat was not appreciably different.

The importance of habitat is evident in the general correlation of range of subspecies and extent of habitat. It is also evident where thin lines of song sparrows occupied territory joining salt marsh and uplands. The change (that is, zone of intergradation) from one subspecies to the next occurred not halfway along the connecting avenues, nor at the position on the avenue where the population is narrowest or least dense, but precisely at the zone of intermediate habitat.

Marshall's conclusion is inescapable—that these are not ecological races in the sense that within the same area two subspecies occur throughout, the one occurring at any point depending on the habitat available. Rather, they are typical geographical subspecies representing each other geographically.

In miniature, they represent what happens on a continental scale. Sharp ecological differences reinforced by partial geographical isolation (gaps in the range due to uninhabitable terrain) have greatly reduced the zone of overlap and made evolution possible on this small scale.—A. L. RAND.

The parasitic cuckoos of Africa.—FRIEDMANN, HERBERT. (Wash. Acad. Sci., Wash., D. C.), pp. xii + 204, 10 plates. January 10, 1948. Price, \$4.50.—This is the first in a series of monographs to be published by the Washington Academy of Sciences.

Following the general pattern established in his 'The Cowbirds' (1929) and in subsequent publications, Dr. Friedmann has brought together all available information on these birds. The data are derived from publications, personal experience, and correspondence over a period of some 25 years that he has been interested in brood parasitism.

The species and certain races of *Clamator*, *Cuculus*, *Pachycoccyx*, *Cercococcyx*, and *Chrysococcyx* are discussed in relation to their taxonomy, range, migration, courtship, eggs, parasitic behavior, species parasitized, and plumages at different ages. This mass of factual material is briefly analyzed and evaluated, in each account, in the light of the author's wide experience in this phase of ornithology. Such discussions give added value and interest.

As is noted in the introduction, there are many gaps in our knowledge of these cuckoos. This book fills out part of the story but, at the same time, the scantiness of the data in several sections re-emphasizes the need for additional field work before definite conclusions can be formulated. Even though this state of affairs may prohibit extensive theorizing as to the implications of parasitism in these species, the general ornithological reader would have been interested in a more complete treatment of Dr. Friedmann's comments or thoughts on this interesting group. Two pages of "concluding remarks" hardly do justice to the time and effort expended in gathering the data.—H. I. FISHER.

Catalogue of Birds of the Americas and the Adjacent Islands.—HELLMAYR, CHARLES E. and BOARDMAN CONOVER. Field Mus. Nat. Hist., Zool. Series, vol. 13, pt. 1, no. 3: vi + 383 pp., December 16, 1948.—The publication of two parts of such a series as this in a single year is without precedent, and the statement in the preface that the final part is now in course of publication foreshadows the completion of the magnificent enterprise initiated by C. B. Cory over 30 years ago.

The present part contains the Charadriiformes and conforms to the high standards set in the previous parts. The literature up to the end of 1944 has been taken into account and some new forms described since that date and prior to January 1, 1947, are mentioned in footnotes. In this connection it is interesting to note that the only known breeding station of the bristle-thighed curlew, discovered in 1948, is listed under the range of that species.

It is a pleasure to observe the degree of conservatism displayed in recognizing some of the new "discoveries", setting up of old names, and even continuing the recognition of forms named many years ago. Such statements as "the difference too inconstant for recognition", "divergence too slight to be expressed in nomenclature" appear in footnotes scattered throughout the work.

No radical innovations are introduced; generic concepts as a rule are maintained as at present, although *Endomychura* is lumped with *Brachyramphus* in spite of Storer's assertion that this course is incorrect. *Larus schistisagus*, *Larus occidentalis* and subspecies and *Larus dominicanus* and subspecies are all considered races of *Larus marinus*.

This volume maintains the high standards of thoroughness and accuracy which characterize the previous ones and which render the 'Catalogue of Birds of the Americas' an ornithologist's "must."—J. L. PETERS.

Waterfowl of Japan.—AUSTIN, OLIVER L., JR. (Gen. Hdqts., Supreme Comm. Allied Powers, Tokyo), Nat. Resources Sec., Rept. No. 118: 1-109, many ill. and tables. January 17, 1949.—This report is designed to acquaint members of the occupation forces with the kinds and status of waterfowl in Japan and to form a partial basis for action on the waterfowl problem.

The first two-thirds of the publication consist of species accounts in which the present status, distribution and field characters are stressed. These deal with 40 species of ducks, geese and swans. Of importance in these accounts are the results of banding work, heretofore not published. Records of occurrence are cited for the rarer forms.

The last 35 pages are devoted to a general treatment of the subject, including areas of winter concentration, flight routes, kill by districts, the total recorded kill from 1924 to 1947, and the means by which this kill was attained.

The importance of the wild waterfowl industry in Japan is shown by the fact that 10 per cent of all bird meat currently used comes from this source. Its annual market value probably exceeds one million dollars. The pressure of this use lies on a few species, for of the 40 species discussed, seven are reported as stragglers only and 19 are too scarce to be of economic importance. Only six species breed in Japan, and then to only a limited extent. None of the species are endemic to Japan alone.

Prior to 1900, the populations declined rapidly. Since 1900, the decline has been slowed down, but present kill is greater than the annual increment. Many deleterious methods of securing birds, such as kill-netting and liming have only recently been outlawed, and some still persist. In this connection it is interesting to note

that live-netting, under the proper conditions and supervision, could be made to work effectively as an instrument of game management.

From the standpoint of increase of knowledge of birds the significant sections of this paper are those concerned with banding. Results of banding in Japan have never been widely circulated. By analyzing the records from 1925, when banding operations were started, to 1942, when they ceased, it has been possible to define certain routes of migration and areas of concentration. It has, for example, been found that there is considerable exchange of individuals between areas of winter concentration and that most of the birds killed in Japan were produced elsewhere.—H. I. FISHER.

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OBITUARIES

SIR HUGH STEWART GLADSTONE, Lord Lieutenant of Dumfries County since 1946 and a Corresponding Fellow of the American Ornithologists' Union since 1923, died at Thornhill, Scotland, April 5, 1949, in his 72nd year. Born April 30, 1877, the eldest son of the late S. S. Gladstone, he received his early education at Eton and

the degree of M.A. from Trinity Hall, Cambridge. In 1907, he married Cecil Emily, eldest daughter of the late Gustavus Talbot, M. P.

He served as a member of the Council of the Zoological Society of London from 1916 to 1941, as Vice-president of the Society in 1925-26 and 1932-33, and as Chairman of the Wild Birds Protection Committee for Scotland since 1921. He was also Chairman of the British Section of the International Committee for Protection of Birds, 1923-29, and a member of the Wild Birds Protection Advisory Committee for England since 1937.

Gladstone was interested chiefly in bird protection and shooting. Among his principal publications were: 'The Birds of Dumfriesshire,' 1910; 'Catalogue of the Vertebrate Fauna of Dumfriesshire,' 1912; 'Birds and the War,' 1919; 'Record Bags,' 2nd ed., 1930; and articles on birds in 'The Scottish Naturalist.' In 'The Auk' for October, 1938, pp. 686-687, appeared a review of his 'Thomas Watling of Dumfriesshire.' This was a 75-page account from the 'Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society,' published in 1938, of the activities of Watling who was one of the first artists to depict the birds of Australia. Little was known of the details of his life and this biography represented five years of difficult research.—T. S. PALMER.

GEORGE WASHINGTON GRAY, an Associate Member of the American Ornithologists' Union since 1920, died at Greenvale Farm near Poughkeepsie, New York, on November 17, 1948. Here he was born January 17, 1885. He was a graduate of the Riverview Military Academy, Poughkeepsie. Much field work was done by him on the birds of Dutchess County in the company of the late Maunsell S. Crosby, Allen Frost, and Raymond G. Guernsey, and he published several notes on his findings. He ran the Farm except for the period, January 1, 1934, to August 1, 1947, when he was Town Clerk of the Town of Poughkeepsie. Burial took place at the Manchester Rural Cemetery near his home.—A. W. SCHORGER.

ARTHUR PATTERSON CHADBOURNE, who became an Associate Member of the American Ornithologists' Union in 1883, a Member in 1889, and a Fellow in 1901, was born in Boston, December 18, 1862. He graduated from Harvard College in 1885 and from the Harvard Medical School in 1889. Following service in Boston hospitals, he studied in Europe in 1891 and 1892. Private practice was begun about 1895.

His interest in birds crystallized in 1882 when, as a Harvard undergraduate, he was admitted to the Nuttall Ornithological Club. He continued as a member until 1923, serving as the Club's Secretary from 1885 to 1889. In 1882 and 1883 he was one of the two editors of the 'Quarterly Journal of the Boston Zoölogical Society' to which he contributed three ornithological papers.

In May, 1891, he represented the A. O. U. at the International Ornithological Congress, Budapest. His contributions to 'The Auk' number 16. They begin in 1886 with a description of a new subspecies of the field sparrow from Texas, *Spizella pusilla arenacea*, still in the Check-List, and end in 1905 with a paper on the breeding of the brown creeper in Massachusetts. His papers on dichromatism in the screech owl and the color changes during molting in the bobolink provoked much discussion.

He was inactive as an ornithologist in later years, but following the First World War he rendered professional service in various federal and state agencies. Retirement took place in 1933. He died at his home in Washington, D. C., December 2, 1936, and was buried in Mount Auburn Cemetery, Cambridge, Massachusetts.—FRANCIS H. ALLEN.

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